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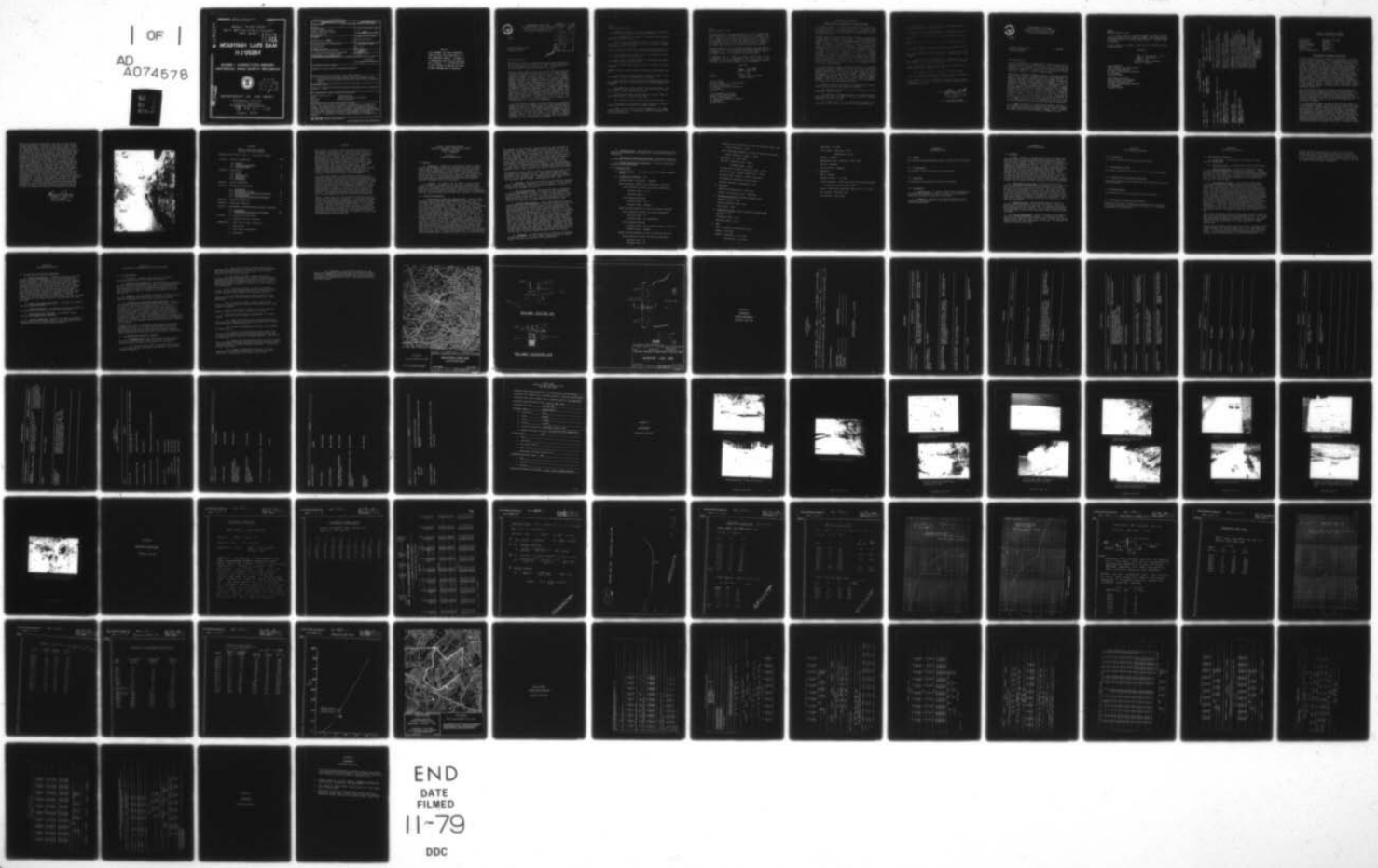

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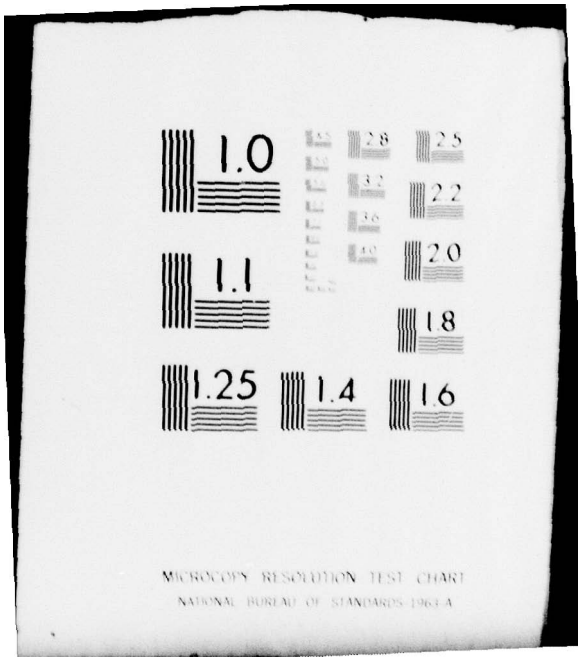
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PASSAIC RIVER BASIN
TROY BROOK, MORRIS COUNTY
NEW JERSEY

LEVEL II

MOUNTAIN LAKE DAM
NJ 00284

PHASE 1 INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

DEPARTMENT OF THE ARMY
Philadelphia District
Corps of Engineers
Philadelphia, Pennsylvania

August 1979

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER NJ00284	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report National Dam Safety Program Mountain Lake Dam Morris County, N.J.		5. TYPE OF REPORT & PERIOD COVERED (9) FINAL report 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) (10) Guinan, Warren A. ~~[illegible]~~ / Guinan		8. CONTRACT OR GRANT NUMBER(s) (15) DACW61-79-C-0011 ✓
9. PERFORMING ORGANIZATION NAME AND ADDRESS Anderson-Nichols 6 Louden Road Concord, NH 03301		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS (12) 86
11. CONTROLLING OFFICE NAME AND ADDRESS U.S. Army Engineer District, Philadelphia Custom House, 2d & Chestnut Streets Philadelphia, Pennsylvania 19106		(11) 12. REPORT DATE August 1979 13. NUMBER OF PAGES 40
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)		15. SECURITY CLASS. (of this report) Unclassified 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for public release; distribution unlimited.

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

(6) National Dam Safety Program. Mountain Lake Dam (NJ-00284), Passaic River Basin, Troy Brook, Morris County, New Jersey. Phase I Inspection Report.

18. SUPPLEMENTARY NOTES

Copies are obtainable from National Technical Information Service, Springfield, Virginia, 22151.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Mountain Lake Dam, N.J.
Dams
Spillways
Seepage
Visual Inspection
National Dam Inspection Act Report
Structural Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report cites results of a technical investigation as to the dam's adequacy. The inspection and evaluation of the dam is as prescribed by the National Dam Inspection Act, Public Law 92-367. The technical investigation includes visual inspection, review of available design and construction records, and preliminary structural and hydraulic and hydrologic calculations, as applicable. An assessment of the dam's general condition is included in the report.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

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DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO

NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

25 SEP 1979

Dear Governor Byrne:

Inclosed is the Phase I Inspection Report for Mountain Lake Dam in Morris County, New Jersey which has been prepared under authorization of the Dam Inspection Act, Public Law 92-367. A brief assessment of the dam's condition is given in the front of the report.

Based on visual inspection, available records, calculations and past operational performance, Mountain Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since 48 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepages at the downstream toe and design appropriate remedial measures.

(2) Specify and supervise procedures for removing trees and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Design repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(4) Design repairs for the erosion on the downstream slope of the dam and appropriate slope protection.

(5) Inspect the contact between the downstream face and the east abutment after the removal of debris.

(6) Design adequate means to drain the reservoir in case of emergency.

Resulting remedial measures should be initiated within calendar year 1980.

c. The following remedial actions should be completed within three months from the date of approval of this report:

(1) Initiate a program to check the condition of the dam periodically and monitor the seepage until remedial measures are effected.

(2) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and operated periodically to ensure continued functioning.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Initiate a program to control trespassing on the dam.

(2) Clear trees and brush on either side of the downstream channel to facilitate identification of seepage problems.

e. Within one year from the date of approval of this report, initiate a program to make a comprehensive technical inspection of the dam once every two years.

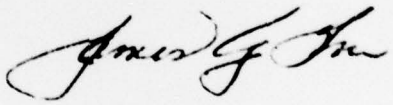
NAPEN-D
Honorable Brendan T. Byrne

A copy of the report is being furnished to Mr. Dirk C. Hofman, New Jersey Department of Environmental Protection, the designated State Office contact for this program. Within five days of the date of this letter, a copy will also be sent to Congressman James A. Courter of the Thirteenth District. Under the provision of the Freedom of Information Act, the inspection report will be subject to release by this office, upon request, five days after the date of this letter.

Additional copies of this report may be obtained from the National Technical Information Services (NTIS), Springfield, Virginia 22161 at a reasonable cost. Please allow four to six weeks from the date of this letter for NTIS to have copies of the report available.

An important aspect of the Dam Safety Program will be the implementation of the recommendations made as a result of the inspection. We accordingly request that we be advised of proposed actions taken by the State to implement our recommendations.

Sincerely,



1 Incl
As stated

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies furnished:
Mr. Dirk C. Hofman, P.E., Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

Mr. John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

MOUNTAIN LAKE DAM (NJ00284)

CORPS OF ENGINEERS ASSESSMENT OF GENERAL CONDITIONS

This dam was inspected on 17 May 1979 by Anderson-Nichols and Company, Inc. under contract to the State of New Jersey. The State, under agreement with the U.S. Army Engineer District, Philadelphia, had this inspection performed in accordance with the National Dam Inspection Act, Public Law 92-367.

Mountain Lake Dam, a high hazard potential structure, is judged to be in fair overall condition. The spillway is considered seriously inadequate since 48 percent of the Probable Maximum Flood (PMF) would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE classification applied for a structural deficiency. It does mean, however, that based on an initial screening, and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam would take place, significantly increasing the hazard of loss of life downstream from the dam. To insure adequacy of the structure, the following actions, as a minimum, are recommended:

a. The spillway's adequacy should be determined by a qualified professional consultant engaged by the owner using more sophisticated methods, procedures, and studies within six months from the date of approval of this report. Any remedial measures necessary to insure the adequacy of the spillway and to prevent overtopping should be initiated within calendar year 1980. In the interim, a detailed emergency operation plan and warning system should be promptly developed. Also, during periods of unusually heavy precipitation, around the clock surveillance should be provided.

b. Within six months from the date of approval of this report, engineering studies and analyses should be performed to:

(1) Investigate the seepages at the downstream toe and design appropriate remedial measures.

(2) Specify and supervise procedures for removing trees and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Design repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(4) Design repairs for the erosion on the downstream slope of the dam and appropriate slope protection.

(5) Inspect the contact between the downstream face and the east abutment after the removal of debris.

(6) Design adequate means to drain the reservoir in case of emergency.

Resulting remedial measures should be initiated within calendar year 1980.

c. The following remedial actions should be completed within three months from the date of approval of this report:

(1) Initiate a program to check the condition of the dam periodically and monitor the seepage until remedial measures are effected.

(2) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and operated periodically to ensure continued functioning.

d. The following remedial actions should be completed within six months from the date of approval of this report:

(1) Initiate a program to control trespassing on the dam.

(2) Clear trees and brush on either side of the downstream channel to facilitate identification of seepage problems.

e. Within one year from the date of approval of this report, initiate a program to make a comprehensive technical inspection of the dam once every two years.

APPROVED: James G. Ton
JAMES G. TON
Colonel, Corps of Engineers
District Engineer

DATE: 22 Sep 1979

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
CUSTOM HOUSE - 2D & CHESTNUT STREETS
PHILADELPHIA, PENNSYLVANIA 19106

IN REPLY REFER TO
NAPEN-D

Honorable Brendan T. Byrne
Governor of New Jersey
Trenton, NJ 08621

13 SEP 1979

Dear Governor Byrne:

This is in reference to our ongoing National Program for Inspection of Non-Federal Dams within the State of New Jersey. Mountain Lake Dam (Federal I.D. No. NJ00284), a high hazard potential structure has recently been inspected. The dam is owned by the Borough of Mountain Lakes and is located on Troy Brook in Mountain Lakes.

Using Corps of Engineers screening criteria, it has been determined that the dam's spillway is seriously inadequate since approximately 48 percent of the Probable Maximum Flood would overtop the dam. The seriously inadequate spillway is assessed as an UNSAFE, non-emergency condition, until more detailed studies prove otherwise, or corrective measures are completed. The classification of UNSAFE applied to a dam because of a seriously inadequate spillway is not meant to indicate the same degree of emergency as would be associated with an UNSAFE unclassification applied for a structural deficiency. It does mean, however, that based on an initial screening and preliminary computations, there appears to be a serious deficiency in spillway capacity so that if a severe storm were to occur, overtopping and failure of the dam could take place, significantly increasing the hazard potential to loss of life downstream from the dam. As a result of this UNSAFE determination, it is recommended that the dam's owner take the following measures within 30 days of the date of this letter:

a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtopping of the dam.

b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, round-the-clock surveillance should be provided during periods of unusally heavy precipitation.

A final report on this Phase I Inspection will be forwarded to you within two months.

Sincerely,

Jack Tollefson LTC

JAMES G. TON
Colonel, Corps of Engineers
District Engineer

Copies Furnished:
Dirk C. Hofman, Actg. Deputy Director
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

John O'Dowd, Acting Chief
Bureau of Flood Plain Management
Division of Water Resources
N.J. Dept. of Environmental Protection
P.O. Box CN029
Trenton, NJ 08625

UNSAFE DAM
NATIONAL PROGRAM OF INSPECTION OF DAMS

a. NAME: Mountain Lake Dam

b. ID NO.: NJ00284

c. LOCATION State: New Jersey. County: Morris.
River or Stream: Troy.
Nearest D/S City or Town: Mountain Lakes.

d. HEIGHT: 13 feet.

e. MAXIMUM IMPOUNDMENT CAPACITY: 1154 ac ft.

f. TYPE: Earthfill.

g. OWNER: Borough of Mountain Lakes.

h. DATE GOVERNOR NOTIFIED OF UNSAFE CONDITIONS: 13 Sep 79.

i. CONDITION OF DAM RESULTING IN UNSAFE ASSESSMENT Preliminary report calculations indicate 48% of PMF would overtop the dam.

l. URGENCY CATEGORY: UNSAFE, Non-Emergency.

m. EMERGENCY ACTIONS TAKEN:
Gov. notified of this condition by District Engineer's letter of 13 Sep 79.

j. DESCRIPTION OF DANGER INVOLVED:
Overtopping and failure of the dam would significantly increase hazard potential to loss of life and property downstream of dam.

h. REMEDIAL ACTIONS TAKEN:
N.J.D.E.P. will notify dam's owner upon receipt of our letter.

k. RECOMMENDATIONS GIVEN TO GOVERNOR:
Within 30 days of date of District Engineer letter the owner to do the following:
a. Engage the services of a qualified professional consultant to more accurately determine the spillway adequacy by using more detailed and sophisticated hydrologic and hydraulic analyses, and to recommend any remedial measures required to prevent overtoppoing of the dam.
b. In the interim, a detailed emergency operation plan and downstream warning system should be developed. Also, around-the-clock surveillance should be provided during periods of unusually heavy precipitation.

o. REMARKS: Final report, to be issued within six weeks, will have WHITE cover.

W. H. ZINK, Coordinator
Dam Inspection Program
U.S.A.E.D., Philadelphia

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Mountain Lake Dam
ID Number:	NJ00284
State Located:	New Jersey
County Located:	Morris
Stream:	Troy Brook
River Basin:	Passaic
Date of Inspection:	May 17, 1979

ASSESSMENT OF GENERAL CONDITIONS

Mountain Lake Dam is an old dam of undetermined age and is in fair overall condition. It is intermediate in size and is classified as High Hazard. A seepage estimated as 10-15 gpm was observed at the toe of the dam. Trees up to 18 inches in diameter are growing on the downstream slope of the dam. Extensive evidence of trespassing and erosion was observed on the downstream slope of the embankment. The top of the concrete core wall, which is visible on the crest of the dam, has numerous surface cracks and spalled areas. The concrete facing on the upstream slope of the dam has cracks, some of which are open. Some cracks have been patched. The wingwalls of the concrete spillway structure exhibit numerous areas of spalling, cracking and erosion. There are two cracks in the concrete deck over the spillway structure. The steel gate is severely corroded on the surface. There is surface rust on the rest of the operating mechanism.

The Wildwood Lake Dam and Spillway, and the spillway of Mountain Lake are capable of passing 47 percent of the PMF without causing the Mountain Lake Dam to overtop. Dam failure resulting from overtopping would significantly increase the hazard to loss of life downstream over the non-failure condition. Thus the spillway is judged to be seriously inadequate.

It is recommended that the owner retain the services of a professional engineer, qualified in the design and inspection of dams, to accomplish the following tasks within the specified time frames. Starting very soon: investigate the seepages at the downstream toe and design and implement appropriate remedial measures; specify and supervise procedures for removing trees, their root systems and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam; and conduct additional detailed hydrologic and hydraulic analysis of the Mountain and Wildwood Lake watersheds, reservoirs, connector channel,

dams and spillways to determine the need for and type of mitigating measures required to provide for safe passage of high discharges. Starting in the near future: design and implement repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure; repair the erosion on the downstream slope of the dam and provide appropriate slope protection; and inspect the contact between the downstream face of the embankment and the left abutment after the debris that has been dumped there is cleared away. In the future, design and install adequate means to drain the reservoir in case of emergency. It is further recommended that the owner undertake the following as a part of operating and maintenance procedures. Starting very soon, check the condition of the dam periodically and monitor the seepage until remedial measures are effected. Starting soon, control trespassing on the dam, and clear trees and brush on either side of the downstream channel for a distance downstream of the dam to allow for identification of seepage problems. In the future, engage a professional engineer, qualified in the design and inspection of dams, to make a comprehensive technical inspection of the dam once every two years. In the near future, establish a surveillance program for use during and immediately following periods of heavy rainfall, and also a warning program to follow in case of floodflow conditions or imminent dam failure.

Warren A. Guinan

Warren A. Guinan, P.E.
Project Manager
New Jersey No. 16848

17 May 1979

OVERVIEW

MOUNTAIN LAKE DAM

CONTENTS

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY REPORT

MOUNTAIN LAKE DAM N.J. NO.--- FED ID NO. NJ00284

PREFACE

This report is prepared under guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation, and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I investigation; however, the investigation is intended to identify any need for such studies.

In review this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the Spillway Test Flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. The test flood provides a measure of relative spillway capacity and serves as an aid in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY INSPECTION PROGRAM
MOUNTAIN LAKE DAM
U.S. #NJ00284

SECTION I
PROJECT INFORMATION

1.1 General

a. Authority. Authority to perform the Phase I Safety Inspection of Mountain Lake Dam was received from the State of New Jersey, Department of Environmental Protection, Division of Water Resources by letter dated 4 April 1979 under Contract NO. FPM-39 dated 28 June 1978. This Authority was given pursuant to the National Dam Inspection Act, Public Law 92-367 and the U.S. Army Engineers District, Philadelphia. The inspection discussed herein was performed by Anderson-Nichols & Company, Inc. on 17 May 1979.

b. Purpose. The purpose of the Phase I Investigation is to develop an assessment of the general conditions with respect to the safety of Mountain Lake Dam and appurtenances based upon available data and visual inspection, and determine any need for emergency measures and conclude if additional studies, investigations and analyses are necessary and warranted.

1.2 Project Description

a. Description of Dam and Appurtenances. Mountain Lake Dam is an old (construction date unknown) earthfill dam, which is approximately 100 feet long, has a structural height of 12.3 feet and a hydraulic height of 12.0 feet. The topwidth of the dam is approximately 13 feet. The upstream face is paved with concrete and has a 3H:1V slope. The dam has a concrete core wall 2 feet thick. The downstream face slopes at 2H:1V. A concrete spillway structure is located at the center of the dam. Concrete spillway abutments, 2-feet thick, define the 3.3-foot wide spillway opening through the dam. The top of the spillway structure is covered with a concrete deck. The upstream opening is limited by wood stoplogs (3 inches thick) to a size of 3.3-foot x 2.6-foot. Immediately downstream of the stoplogs, flow is discharged through an opening controlled by a steel gate and into a 3.3-foot wide by 3.2-foot high, 5-foot long concrete box which discharges between the spillway abutments at an elevation approximately halfway between the dam crest and toe. The mechanical operating mechanism for the steel gate is on the top of the spillway structure. At the northeast end of Mountain Lake a connector channel leads to Wildwood Lake.

The channel is well defined, approximately 20 feet wide and is spanned by 3 bridges. The gradient of the channel is flat, or nearly flat, and allows for free flow of water between the two lakes. Wildwood Lake is impounded by a 836-foot long by 7- to 12- foot high dam. The dam crest is 0.8 foot below the crest of Mountain Lake Dam. The spillway of Wildwood Lake Dam consists of a concrete structure with a 3.3-foot wide opening. The water level is controlled by stoplogs, which at the time of measurement limited the spillway opening to 3.3 feet wide by 1.9 feet high. Downstream of the stoplogs, flow passes beneath a steel gate and into a conduit of undetermined size which leads beneath a road. The outlet of the culvert could not be located.

The watershed above these two lakes is gently sloping and fully developed as a residential area. Three tandem impoundments, Birchwood Lake, Crystal Lake and Sunset Lake occupy the upper portion of the drainage area. Sunset Lake drains into Mountain Lake through a small channel, approximately 1500' long.

b. Location. The dam is located in the Borough of Mountain Lakes, Morris County, New Jersey, on Troy Brook. It has coordinates north latitude 40° 53.0' and west longitute 74° 26.8'. A location map is shown in Figure 1.

c. Size Classification. Mountain Lake Dam is classified as being intermediate in size, as defined in the Recommended Guidelines for Safety Inspection of Dams, on the basis of its storage volume at the dam crest of 1154 acre-feet which is less than 50,000 acre-feet, but more than 1000 acre-feet, and its structural height is 12.3 feet which is less than 40 feet.

d. Hazard Classification. Visual inspection of the area downstream of the dam showed that a failure of Mountain Lake Dam could cause excessive property damage to two houses with an estimated population of 8 persons, located approximately 500 feet downstream of the dam. The houses are adjacent to a road culvert for the discharge channel and have first floor elevations about 4 feet above the channel invert. The culvert is 3 feet high by 7 feet wide by 36 feet long and would likely be washed out should the dam fail. The steeply sloping and relatively narrow discharge channel would clearly cause a high hazard to loss of life from large flows downstream of the dam. Mountain Lake Dam is thus classified as High Hazard. Furthermore, Mountain Lake controls flow from Wildwood Lake. Wildwood Lake Dam is lower (0.8 feet) than Mountain Lake Dam; therefore, it would overtop before Mountain Lake Dam. A grade school building is located about 200 feet downstream of Wildwood Lake Dam directly in the path of the water should Wildwood Lake Dam overtop.

e. Ownership. Mountain Lake Dam is owned by the Borough of Mountain Lakes. Mr. Carl Danser, Superintendent of Public Works (334-3131) was contacted for information.

f. Purpose of Dam. The reservoir is the focal point for substantial residential development and is extensively used for recreation.

g. Design and Construction History. No plans, hydraulic or hydrologic data for the original construction were disclosed.

h. Normal Operational Procedures. No formal operational procedures were disclosed.

1.3 Pertinent Data

a. Drainage Areas - 1.27 square miles (includes Wildwood Lake)

b. Discharge at Damsite - cfs

Maximum flood at dam site - unknown

Gated spillway capacity at normal pool elevation

With stoplogs in place (as during inspection)

Mountain Lake - ± 1.0

Wildwood Lake - 0

With stoplogs removed

Mountain Lake - 114

Wildwood Lake - unknown

Gated spillway capacity at top of Mountain Lake Dam

With stoplogs in place (as during inspection)

Mountain Lake - 57

Wildwood Lake - 28 (estimated)

With stoplogs removed

Mountain Lake - 163 (concrete conduit controls)

Wildwood Lake - unknown

Gated spillway capacity at top of Wildwood Lake Dam

With stoplogs in place (as during inspection)

Mountain Lake - 35

Wildwood Lake - 28

Discharge over Wildwood Dam crest at Mountain Lake - dam crest elevation - 2146

Total discharge capacity at crest of Mountain Lake Dam - (With stoplogs in place) - 2230

c. Elevation (ft. above MSL)

Top Dam - Mountain Lake - 492.3

- Wildwood Lake - 491.5

Maximum pool - design surcharge (PMF) - 493.2

Recreation pool (during inspection) - 489.6

Spillway crest (gated) - 489.4 (stoplogs)

Streambed at centerline of dam - 480.0

Maximum tailwater (estimated) - 483

d. Reservoir

Length of maximum pool - 3070 feet

Length of recreation pool - 3000 feet

e. Storage (acre-feet) includes Wildwood Lake

Recreation pool - 899

Design surcharge (PMF) 1269

Top of dam - 1154

f. Reservoir Surface (acres) includes Wildwood Lake

Top dam - 92.1

Recreation pool - 91.3

Spillway crest - 91.3

g. Dam

Type - earthfill with concrete core

Length - 100 feet

Height - hydraulic - 12.0 feet

- structural - 12.3 feet

Top width - 13 feet

Side Slopes - upstream 3H:1V

- downstream 2H:1V

Zoning - unknown

Impervious core - concrete 2 feet thick

Cutoff - unknown

Grout curtain - unknown

h. Spillway

Type - stoplog

Length of weir - 3.3 feet

Crest elevation - 489.4 feet above MSL (with stoplogs in place as during inspection)

Gates - steel gate regulates opening 3.2 x 3.3 feet

U/S Channel - Mountain Lake

D/S Channel - Troy Brook

SECTION 2
ENGINEERING DATA

2.1 Design

No original engineering design data or plans were disclosed.

2.2 Construction

No original construction data were disclosed.

2.3 Operation

No engineering operational data were disclosed.

2.4 Evaluation

a. Availability. A search of New Jersey Department of Environmental Protection files and contact with community officials revealed no recorded information.

b. Adequacy. Because no recorded information was disclosed, the evaluation of this dam was based solely on visual observations.

SECTION 3
VISUAL INSPECTION

3.1 Findings

a. Dam. Seepage is discharging at 10-15 gpm near the downstream toe of the dam between the discharge channel and the east (left) abutment and between the discharge channel and the west abutment. Trees up to 18 inches in diameter are growing on the downstream slope of the dam and in the area immediately downstream of the dam. There is extensive trespassing and erosion on the downstream slope, particularly on the east side of the concrete spillway structure. Debris (mostly leaves and grass) has been dumped on the contact between the downstream slope and the west abutment. The top of the concrete core wall which is visible on the crest of the dam has numerous surface cracks and spalled areas. The concrete facing on the upstream slope of the dam has numerous cracks, some of which are open and some of which are patched.

b. Appurtenant Structures. The wing walls of the concrete spillway structure exhibit numerous areas of spalling and erosion, minor cracking with efflorescence, and some erosion of the concrete at cold joints. The interior faces of the walls are spalled about one inch deep where they are in contact with the water. There is surface rusting of the steel gate slides and operating mechanism. The one-half inch thick gate itself is severely corroded on the surface. The gate was not operated during inspection but appeared to be in operable condition.

c. Reservoir Area. The watershed above the lake is gently sloping and heavily built up with homes. There are many homes on the shore of the lake. No evidence of significant sedimentation was observed. Three tandem impoundments, Brichwood Lake, Crystal Lake and Sunset Lake occupy the upper watershed.

d. Downstream Channel. Trees and brush are growing on the banks of the downstream channel. A residential street with a 3-foot high by 7-foot wide culvert, crosses the channel approximately 500 feet downstream of the dam. The channel and valley are steep and narrow.

SECTION 4
OPERATIONAL PROCEDURES

4.1 Procedures

No formal operating procedures were disclosed.

4.2 Maintenance of Dam

No formal maintenance procedures for the dam were disclosed.

4.3 Maintenance of Operating Facilities

No formal maintenance procedures for the operating facilities were disclosed.

4.4 Warning System

No description of any warning system was disclosed.

4.5 Evaluation of Operational Adequacy

Because of the lack of operation and maintenance procedures the remedial measures described in Section 7.2 c. should be implemented as prescribed.

SECTION 5
HYDROLOGIC/HYDRAULIC

5.1 Evaluation of Features

a. Design Data. No hydrologic or hydraulic design data were disclosed.

b. Experience Data. No experience data were disclosed.

c. Visual Observation. No visible evidence of damage to the structure caused by overtopping was observed. There was rust-stained standing water near the downstream toe between spillway and west abutment. On the east side of the spillway, at the toe, clear water was discharging at an estimated 10-15 gpm. At the time of inspection about 1.0 cfs of water was flowing over the stoplogs.

d. Overtopping Potential. The hydraulic/hydrologic evaluation for Mountain Lake is based on a Spillway Design Flood (SDF) equal to the Probable Maximum Flood (PMF) in accordance with the test flood given in the evaluation guidelines, for dams classified as high hazard and intermediate in size. The PMF has been determined by application of the SCS dimensionless unit hydrograph procedure to a 6-hour PMP storm of 25.5 inches. Mountain Lake and Wildwood Lake were treated as one reservoir to develop the storage-discharge relationship. The inflow hydrograph from the intermediate drainage area was added to routed outflow from Crystal Lake to develop the total inflow hydrograph. Hydrologic computations are given in Appendix 3. The routed PMF peak discharge for the subject watershed is 7,188 cfs. Of this drainage, approximately 590 cfs passes through the spillway and over the Mountain Lake Dam. The remaining 6600 cfs passes through and over Wildwood Lake Dam.

The minimum elevation of Mountain Lake Dam allows 2.9 feet of depth above the stoplogs before overtopping begins. Under this head the spillway capacity of Mountain Lake is 5.7 cfs. Under this same head the Wildwood Lake Dam is discharging approximately 2175 cfs, almost all of it over the crest of this earthen dam.

Assuming that Wildwood Lake Dam will not fail, routing calculations indicate that Mountain Lake Dam will be overtopped for almost 2 hours to a maximum depth of 0.9 feet under PMF conditions. It is estimated that the Wildwood Spillway and Dam, and the Mountain Lake Spillway can pass approximately 47% of

the PMF without causing Mountain Lake Dam to overtop. Because the dam is high hazard, cannot pass 50 percent of the PMF without overtopping and failure, and the hazard to loss of life downstream would be significantly increased with overtopping failure, the spillway of Mountain Lake Dam is judged to be seriously inadequate.

SECTION 6
STRUCTURAL STABILITY

6.1 Evaluation of Structural Stability

a. Visual Observations. Seepage discharging near the downstream toe, if uncorrected, could lead to long-term stability problems. Trespassing and the resulting erosion, if not controlled, may lead to long-term stability problems. If trees growing on the downstream slope and in the area immediately downstream of the dam should blow over and pull out their roots, or if a tree dies or is cut and its roots rot, serious seepage and erosion problems could result. Deterioration of the concrete in the upstream facing, core wall, and spillway structure, if allowed to continue, will impair the long-term structural stability of the dam. Rusting of the spillway gate and gate slides, if not corrected, will impair the structural stability and operability of the spillway.

b. Design and Construction Data. No design or construction data were disclosed.

c. Operating Records. No operating records pertinent to the structural stability of the dam were disclosed.

d. Post-Construction Changes. No records of post-construction changes were disclosed.

e. Seismic Stability. Mountain Lake Dam is located in Seismic Zone 1 and in accordance with the recommended Phase I guidelines does not warrant seismic analysis.

SECTION 7
ASSESSMENT, RECOMMENDATIONS/REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition. Mountain Lake Dam is an old dam of undetermined age and in fair overall condition.

b. Adequacy of Information. The information available is such that the assessment of the dam must be based primarily on the results of the visual inspection. Debris which has been dumped on the contact between the downstream face and the left abutment makes it impossible to inspect that area adequately.

c. Urgency. The recommendations made in Section 7.2 a. and the operating and maintenance procedures in Section 7.2 c. should be implemented by the owner as prescribed below.

d. Necessity for Additional Data/Evaluation. The information available from the visual inspection is adequate to identify the potential problems which are listed in Sections 5 and 6. These problems require the attention of a professional engineer who will have to make additional engineering studies to design or specify remedial measures. If left unattended, the problems could lead to instability of the structure. Because the spillway is judged to be seriously inadequate further detailed hydrologic and hydraulic analysis is required. Also, the contact between the downstream slope and the left abutment should be inspected after removal of the debris.

Although it is not the purpose of this report to evaluate Wildwood Lake Dam, it is clear that because Mountain Lake and Wildwood Lake are an interconnected system, future hydrologic and hydraulic evaluations and remedial measures should address the system and not the structures individually.

7.2 Recommendations/Remedial Measures

a. Recommendations. The owner should retain the services of a professional engineer qualified in the design and construction of dams to accomplish the following:

(1) Starting very soon, investigate the seepages at the downstream toe and design and implement appropriate remedial measures.

(2) Starting very soon, specify and supervise procedures for removing trees, their root systems and brush from the downstream slope of the dam and for a distance downstream of the toe of the dam.

(3) Starting very soon, conduct additional detailed hydrologic and hydraulic analyses of the Mountain and Wildwood Lake watersheds, reservoirs, connector channel, dams and spillways to determine the need for and type of mitigating measures required to provide for safe passage of high discharges.

(4) In the near future, design and implement repairs for the deteriorated concrete on the upstream face of the dam and in the corewall and spillway structure.

(5) In the near future, repair erosion on the downstream slope of the dam and provide appropriate slope protection.

(6) In the near future, inspect the contact between the downstream face and the east abutment after the removal of debris.

(7) In the future, design and install adequate means to drain the reservoir in case of emergency.

b. Operating and Maintenance Procedures. The owner should:

(1) Check the condition of the dam periodically and monitor the seepage until remedial measures are effected. This should be started very soon.

(2) Control trespassing on the dam. This should be started soon.

(3) Clear trees and brush on either side of the downstream channel for a distance downstream from the dam to allow for identification of seepage problems. This should be done soon.

(4) Repair the rusted spillway gate and gate slides. The gate operating mechanism should be lubricated and periodically exercised to ensure continued operation. This should be done very soon.

(5) Engage a professional engineer to make a comprehensive technical inspection of the dam once every two years. This should be started in the future.

(6) Establish a surveillance program for use during and immediately following periods of heavy rainfall, and also a warning program to follow in case of floodflow conditions or imminent dam failure. This should be done in the near future.

Anderson-Nichols & Co, Inc.
BOSTON MASSACHUSETTS

U.S. ARMY ENGINEER DIST. PHILADELPHIA
CORPS OF ENGINEERS
PHILADELPHIA, PA.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MOUNTAIN LAKE DAM
LOCATION MAP

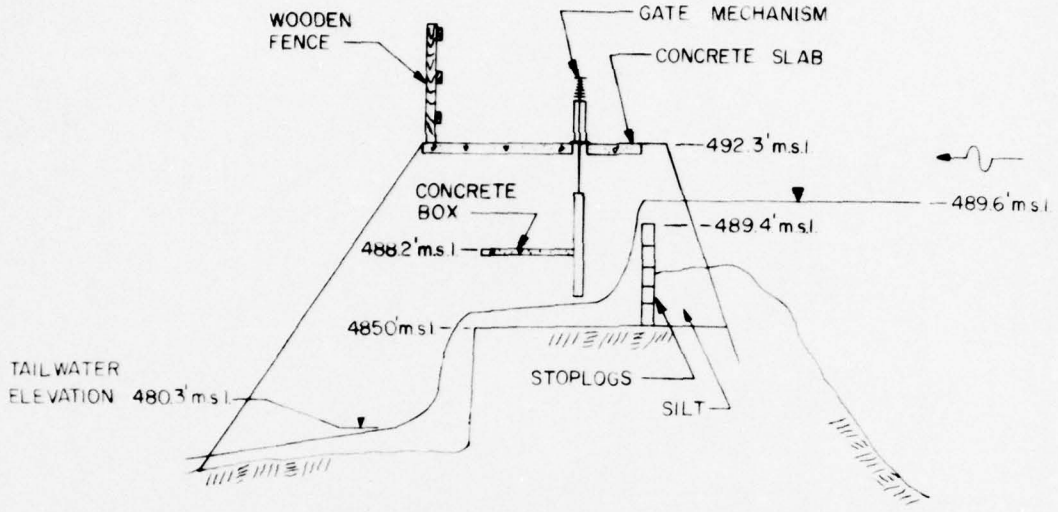
TROY BROOK NEW JERSEY

SCALE: SEE BAR SCALE
DATE: AUGUST, 1979

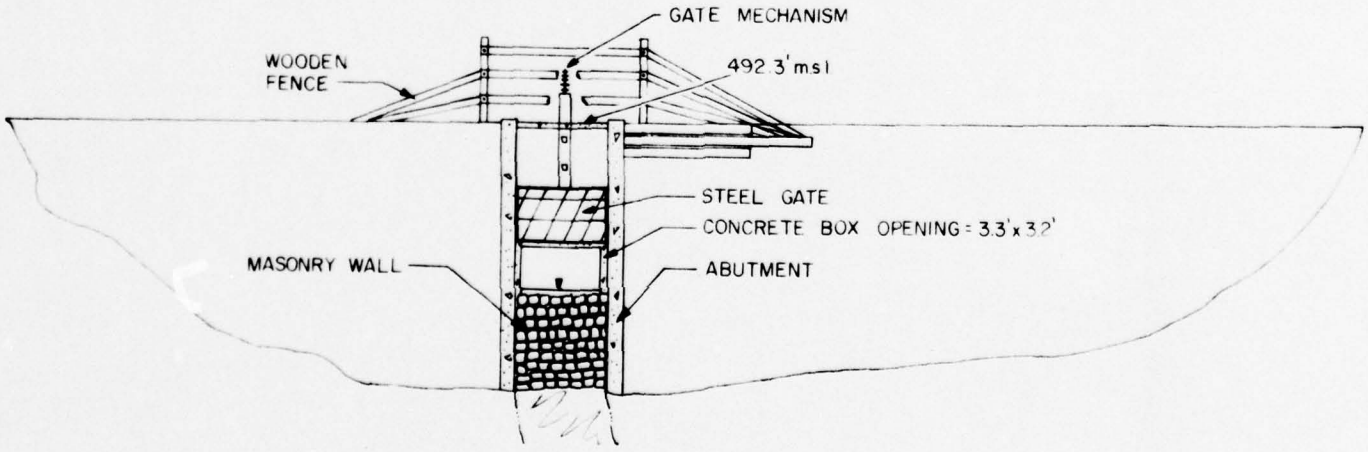
SCALE IN MILES
0 5 10

MAP BASED ON STATE OF NEW JERSEY
OFFICIAL HIGHWAY MAP AND GUIDE.

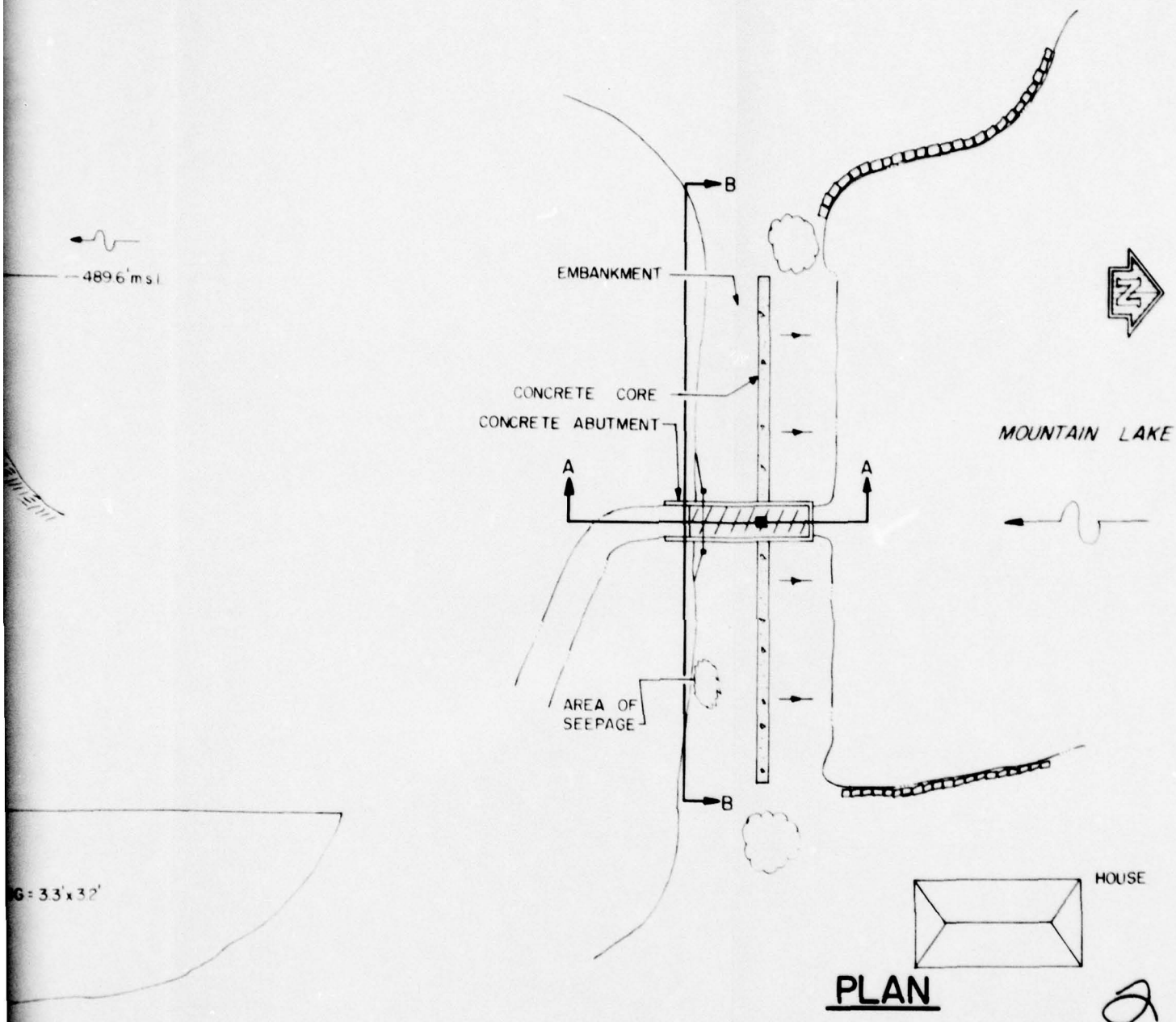
FIGURE 1



SPILLWAY SECTION A-A



SPILLWAY ELEVATION B-B



PLAN

DATA FROM FIELD INSPECTION MAY 17, 1979

Anderson - Nichols & Co., Inc BOSTON MASSACHUSETTS	U.S ARMY ENGINEER DIST PHILADELPHIA CORPS OF ENGINEERS PHILADELPHIA, PA

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MOUNTAIN LAKE DAM

TROY BROOK NEW JERSEY

SCALE: NOT TO SCALE

DATE: AUGUST, 1979

FIGURE 2

APPENDIX 1

CHECKLIST

VISUAL INSPECTION

MOUNTAIN LAKE DAM

Check List
Visual Inspection
Phase 1

Name Dam Mountain Lake Dam County Morris State New Jersey Coordinators NJDEP

Date(s) Inspection May 17, 1979 Weather Sunny Temperature 60° F

Pool Elevation at Time of Inspection 489.6 MSL Tailwater at Time of Inspection 480.3 MSL

Inspection Personnel:

Warren Guinan — Ronald Hirschfeld

Stephen Gilman —

David Deane —

Gilman & Hirschfeld Recorder

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SURFACE CRACKS	Top of core wall has numerous cracks and spalled areas. Concrete pavement on upstream face has numerous surface cracks.	Design and implement appropriate repairs to concrete.
UNUSUAL MOVEMENT OR CRACKING AT OR BEYOND THE TOE	None apparent.	
SLOUGHING OR EROSION OF EMBANKMENT AND ABUTMENT SLOPES	Evidence of trespassing and erosion on downstream slope, particularly next to spillway. Canoes being stored on downstream edge of crest between spillway and left abutment.	Control trespassing on dam. Repair erosion on dam.
VERTICAL AND HORIZONTAL ALIGNMENT OF THE CREST	Good. No indication of distress or movement in core wall alignment.	
RIPRAP FAILURES	No riprap.	Provide appropriate slope protection.

EMBANKMENT

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
RAILINGS		
JUNCTION OF EMBANKMENT AND ABUTMENT, SPILLWAY AND DAM	See "Sloughing and Erosion...." above	
ANY NOTICEABLE SEEPAGE	Standing water(rust-stained) near downstream toe between spillway and right abutment. Soft, wet area near downstream toe between spillway and left abutment with clear water discharging at an estimated 10-15 GPM	Investigate seepage and design appropriate remedial measures.
STAFF GAGE AND RECORDER	None apparent.	
DRAINS	None apparent.	

GATED SPILLWAY

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONCRETE	Concrete buttress walls fair condition - numerous areas of spalling and eroding. Minor cracking with efflorescence. Some erosion of concrete at cold joints. Interior face of concrete walls spalled 1" deep where in contact with water.	Repair cracking and erosion.
APPROACH CHANNEL	Wide and unobstructed.	
DISCHARGE CHANNEL	Boulders and soil in bottom channel, trees and brush in and adjacent to channel.	Clear trees and brush on both sides of discharge channel for a distance downstream of the dam.
BRIDGE AND PIERS	Concrete deck over outlet - good condition. 2 cracks in deck around gate structure. Underside of deck - good condition.	
GATES AND OPERATION EQUIPMENT	Steel gate slides and operating mechanism - surface rusted. ½" thick gate severely corroded on surface.	Clean and paint gates and operating mechanism - lubricate gate operating mechanism.

INSTRUMENTATION

VISUAL EXAMINATION	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
MONUMENTATION/SURVEYS	None apparent.	
OBSERVATION WELLS	None apparent.	
WEIRS	None apparent.	
PIEZOMETERS	None apparent.	
OTHER	None apparent.	

RESERVOIR

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
SLOPES	Gentle wooded. Houses with lawns close to shore.	
SEDIMENTATION	No visible evidence of significant sedimentation.	

DOWNSTREAM CHANNEL

VISUAL EXAMINATION OF	OBSERVATIONS	REMARKS OR RECOMMENDATIONS
CONDITION (OBSTRUCTIONS, DEBRIS, ETC.)	Boulders and soil in bottom of channel. Trees and brush in and adjacent to channel. Steep and rocky.	Clear trees and brush 25 feet on either side of discharge channel for a distance downstream from the dam.
SLOPES	Gentle, wooded.	
APPROXIMATE NO. OF HOMES AND POPULATION	Residential street bridge with 3x7 foot opening 500 feet downstream of dam. Two houses with estimated 8 people have first flood elevations approximately 4 feet above the discharge channel invert.	

CHECK LIST
ENGINEERING DATA
DESIGN, CONSTRUCTION, OPERATION

ITEM	REMARKS
PLAN OF DAM	No original plans were disclosed. Plans for this report were developed from visual inspection.
REGIONAL VICINITY MAP	Prepared for this report.
CONSTRUCTION HISTORY	None disclosed.
TYPICAL SECTIONS OF DAM	Prepared for this report from visual inspection.
HYDROLOGIC/HYDRAULIC DATA	None disclosed.
OUTLETS - PLAN	None disclosed.
- DETAILS	None disclosed.
- CONSTRAINTS	None disclosed.
- DISCHARGE RATINGS	None disclosed.
RAINFALL/RESERVOIR RECORDS	None disclosed.

ITEM	REMARKS
DESIGN REPORTS	None disclosed.
GEOLOGY REPORTS	None disclosed.
DESIGN COMPUTATIONS HYDROLOGY & HYDRAULICS DAM STABILITY SEEPAGE STUDIES	None disclosed.
MATERIALS INVESTIGATIONS BORING RECORDS LABORATORY FIELD	None disclosed.
POST-CONSTRUCTION SURVEYS OF DAM	None disclosed.
BORROW SOURCES	Unknown

ITEM	REMARKS
MONITORING SERVICES	Unknown.
MODIFICATIONS	None disclosed.
HIGH POOL RECORDS	None disclosed.
POST CONSTRUCTION ENGINEERING STUDIES AND REPORTS	None disclosed.
PRIOR ACCIDENTS OR FAILURE OF DAM DESCRIPTION REPORTS	None disclosed.
MAINTENANCE OPERATION RECORDS	None disclosed.

ITEM	REMARKS
SPILLWAY PLAN	No original plans were disclosed.
SECTIONS	Cross-section for this report was prepared from visual inspection.
DETAILS	
OPERATING EQUIPMENT	Rusted steel gate with threaded post (3.3 x 4.7 feet)
PLANS & DETAILS	None disclosed.

CHECK LIST
HYDROLOGIC AND HYDRAULIC DATA
ENGINEERING DATA

DRAINAGE AREA CHARACTERISTICS: 1.27 square miles, gently sloping

ELEVATION TOP NORMAL POOL (STORAGE CAPACITY): 489.4 ft. MSL (881 ac-ft)

ELEVATION TOP FLOOD CONTROL POOL (STORAGE CAPACITY): Not applicable

ELEVATION MAXIMUM DESIGN POOL: 493.2 ft. MSL (PMF)

ELEVATION TOP DAM: 492.3 ft. MSL

SPILLWAY CREST: Stoplog section

a. Elevation 489.4

b. Type Stoplog

c. Width 3 inches

d. Length 3.3 feet

e. Location Spillover approximate center of dam

f. Number and Type of Gates one steel gate with threaded post

OUTLET WORKS: None

a. Type

b. Location

c. Entrance Inverts

d. Exit Inverts

e. Emergency Draindown Facilities

HYDROMETEORLOGICAL GAGES: None

a. Type

b. Location

c. Records

MAXIMUM NON-DAMAGING DISCHARGE: 65 cfs (top of Wildwood Lake Dam)

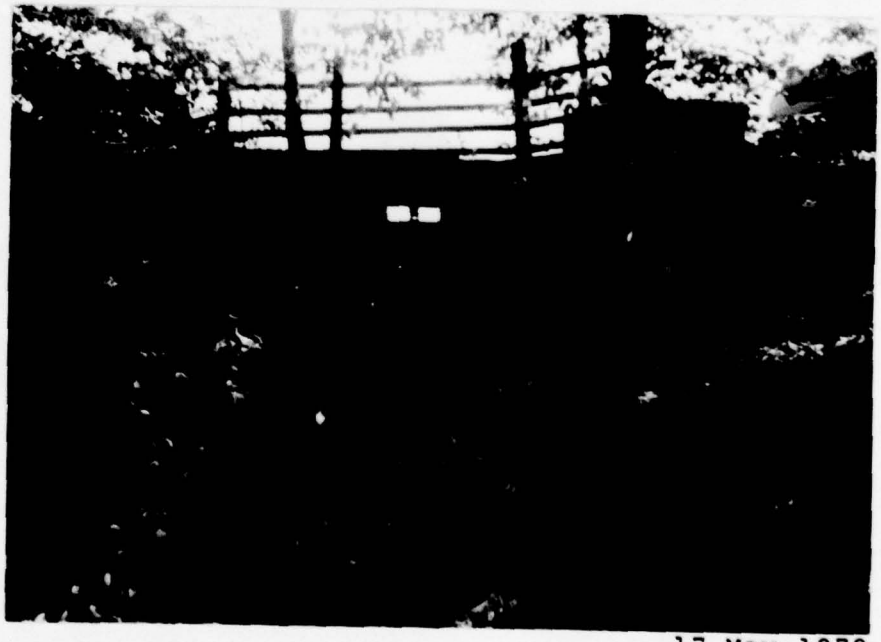
APPENDIX 2

PHOTOGRAPHS

MOUNTAIN LAKE DAM

17 May 1979

Upstream Face of Dam



17 May 1979

Downstream Face of Dam and Spillway

17 May 1979

View Across Dam Crest Looking West

17 May 1979

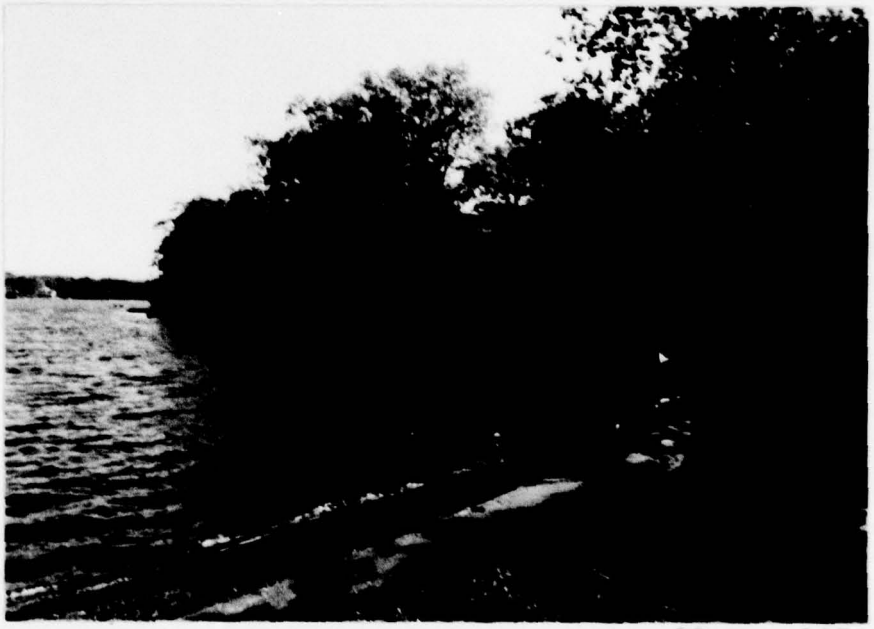
View Downstream From Spillway
At Center of Dam

17 May 1979

Culvert Under Road Immediately
Downstream of Dam

17 May 1979

View of Reservoir From the
Spillway Structure



17 May 1979

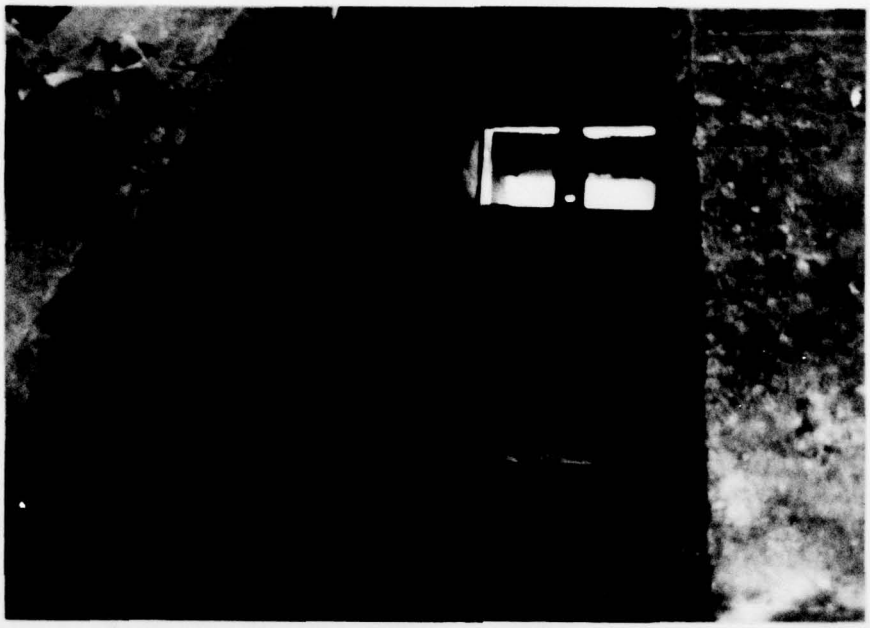
View of East Bank of Reservoir
Looking Northeast from Dam

17 May 1979

Channel Between Mountain Lake
and Wildwood Lake

17 May 1979

Culvert Across Channel Between
Mountain Lake and Wildwood Lake



17 May 1979

Downstream Face of Spillway Structure

17 May 1979

Spillway Gate Mechanism

17 May 1979

Erosion of Downstream Slope on
Left Side of Spillway

17 May 1979

Crack on Concrete Pavement on Upstream
Face of Dam, Between Spillway and East
Bank

17 May 1979

Major Seepage at Downstream Toe Between
Downstream Channel and East Abutment

APPENDIX 3

HYDROLOGIC COMPUTATIONS

MOUNTAIN LAKE DAM

derson-Nichols & Company, Inc. Subject MSH

JOB NO. 3290-05

Sheet No. 1 of 14
Date 05-30-79
Computed
Checked EDB

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MOUNTAIN LAKE DAM

HYDROLOGIC CALCULATIONS

LOCATION : MORRIS COUNTY, N.J.

DRAINAGE AREA : 1.27 SQ. MILE

EVALUATION CRITERIA : SIZE - INTERMEDIATE
HAZARD - HIGH

APPROACH : AS DIRECTED BY DEPARTMENT OF THE ARMY, PHILADELPHIA DISTRICT. CORPS OF ENGINEERS (CUSTOM HOUSE - 2D & CHESTNUT STREETS, PHILADELPHIA, PENNSYLVANIA 19106) IN THE LETTER DATED 29 MAY 1979 FROM LEONARD J. LIPSKI CHIEF OF HYDROLOGY - HYDRAULICS BRANCH, THE FOLLOWING APPROACH WAS TAKEN : THE OUTFLOW FROM CRYSTAL LAKE DAM WAS ROUTED TO MOUNTAIN LAKE DAM, IGNORING THE EFFECT OF SUNSET LAKE, AND ADDED TO THE LOCAL INFLOW. THE SCS TRIANGULAR UNIT HYDROGRAPH WITH THE CURVILINEAR TRANSFORMATION (K-484) WAS USED TO DEVELOP THE LOCAL INFLOW. SINCE MOUNTAIN LAKE AND WILDWOOD LAKE ARE INTER-CONNECTED AND AT APPROXIMATELY THE SAME ELEVATION, THEY WERE TREATED AS ONE RESERVOIR IN TERMS OF DEVELOPING THE STORAGE-DISCHARGE RELATIONSHIP.

derson-Nichols & Company, Inc. Subject M.S.H. Sheet No. 2 of 16

JOB NO. 3290 – 05 Date 05 Computed Checked EDD

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MOUNTAIN LAKE DAM

OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE
UNDER FULL PMF CONDITION

0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	5.	5.	6.	6.	7.	11.	17.	23.	39.
55.	70.	93	116.	135.	152.	165.	178.	190.	206.
229.	268.	367.	592.	866.	1030.	1047.	950.	847.	735.
626.	533.	458.	416.	383.	355.	332	313.	298.	285.
274.	263.	252.	240.	230.	220.	212.	204.	197.	191.
185.	179.	172.	160.	145.	128.	111.	96.	83.	72.
67.	62.	57.	53.	50.	46.	43.	40.	37.	35.

CMS	11.	3.	2.	2.	174.
INCHES		3.04	3.05	3.05	3.05
MM		77.28	77.40	77.40	77.40
AC-FT		47.	47.	47.	47.
THOUS CU M		58.	58.	58.	58.

PMF OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE

STATION A4, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	5.	5.	6.	6.	7.	11.	17.	23.	39.
55.	70.	93.	116.	135.	152.	165.	178.	190.	206.
228.	268.	367.	593.	866.	1030.	1047.	950.	847.	735.
626.	533.	458.	416.	383.	355.	332.	313.	298.	285.
274.	263.	252.	240.	230.	220.	212.	204.	197.	191.
185.	179.	172.	160.	145.	128.	111.	96.	83.	72.
67.	62.	57.	53.	50.	46.	43.	40.	37.	35.

STORAGE

118.	118.	118.	118.	118.	118.	118.	118.	119.	119.
120.	121.	122.	123.	123.	124.	125.	126.	127.	128.
129.	130.	131.	132.	133.	134.	136.	137.	138.	140.
141.	142.	143.	144.	145.	146.	146.	147.	147.	148.
148.	150.	153.	159.	165.	168.	168.	167.	164.	162.
159.	157.	156.	154.	153.	152.	152.	151.	151.	150.
150.	149.	149.	149.	148.	148.	148.	148.	147.	147.
147.	147.	146.	146.	145.	145.	144.	143.	143.	142.
142.	142.	141.	141.	141.	140.	140.	140.	140.	139.

STAGE

535.2	535.2	535.2	535.2	535.2	535.2	535.2	535.2	535.2	535.3
535.3	535.4	535.4	535.4	535.5	535.5	535.6	535.6	535.7	535.7
535.8	535.8	535.8	535.9	535.9	536.0	536.1	536.1	536.2	536.3
536.3	536.4	536.4	536.5	536.5	536.6	536.6	536.6	536.6	536.7
536.7	536.7	536.9	537.1	537.4	537.5	537.5	537.5	537.4	537.3
537.2	537.1	537.0	536.9	536.9	536.9	536.8	536.8	536.8	536.8
536.8	536.7	536.7	536.7	536.7	536.7	536.7	536.7	536.6	536.6
536.6	536.6	536.6	536.6	536.6	536.5	536.5	536.5	536.4	536.4
536.4	536.4	536.3	536.3	536.3	536.3	536.3	536.3	536.3	536.2

3/12

J IS 1047. AT TIME 3.92 HOURS

derson-Nichols & Company, Inc. Subject H&H Sheet No. 4 of 16

JOB NO. 3290-05 Date 8/79 Computed JCS Checked FDD

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

MOUNTAIN LAKE (AND WILDWOOD LAKE AS A ONE RESERVOIR)

TC — TIME OF CONCENTRATION

OVERLAND FLOW $L = 2500'$ $H = 225'$ $S = .09$

① BY KIRPICH NOMOGRAPH $T_c = 7.3$ MINUTES

② BY IZZARD FORMULA

$$T_c = \frac{L^{1.115}}{7700\, H^{.38}} = \frac{2500^{1.115}}{7700 \cdot 225^{.38}} = 6.1 \text{ MINS}$$

③ BY EQUATION — CALIFORNIA CULVERT p.71 DESIGN of SMALL DAM

$$T_c = \left(\frac{11.9 \cdot L^3\,[\text{mi}]}{H\,[\text{ft}]}\right)^{.385} = \left(\frac{11.9 \cdot .473^3}{225}\right)^{.385} = 8.1 \text{ MINS}$$

④ WESTON FORMULA

$$T_c = \frac{L}{3600\, V} = \frac{2500}{3600 \cdot 3.5 \text{ ft/sec}} = 11.9 \text{ MINS}$$

AVERAGE $T_c = 8.5$ MINUTES

PROJECT: High
JOB # 3270-05
DATE: 07/28-29
COMPUTED BY: JG
CHECKED: FDD

MOUNTAIN LAKE DAM — X-SECTION ALONG THE DAM

SCALE: 1" = 5' VER.
1" = 50' HOR.

9/5

Anderson-Nichols & Company, Inc.

Subject 11.5 11.

Sheet No. 6 of 16
Date 3-[illegible]-79
Computed
Checked FJD

JOB NO. 3290 - 05

SQUARES 1/4 IN. SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28

MOUNTAIN LAKE DAM - RATING CURVE COMPUTATION

FLOW OVER THE STOP LOGS ONLY

C = 3.5 L = 3.3 FT.

	ELEV.	H	Q
	489.6	.2	1.0
	489.8	.4	2.9
	490.0	.6	5.4
	490.2	.8	8.3
	490.4	1.0	11.6
	490.6	1.2	15.2
	490.8	1.4	19.1
	491.0	1.6	23.4
	491.5	2.1	35.1
	492.0	2.6	48.4
TOP OF DAM	492.3	2.9	57.0

FLOW THROUGH CONCRETE BOX ONLY

A = 10.6 SQ.FT. C = .8

	ELEV.	H	Q
	488.4	1.8	91.2
	488.6	2.0	96.2
	488.8	2.2	101.0
	489.0	2.4	105.4
	489.2	2.6	109.7
	S	S	S
TOP OF DAM	492.2	5.7	162.5

Anderson-Nichols & Company, Inc.

Subject HSH

Sheet No. 7 of 16

Date 1-25-77

Computed R.C.

Checked RL

JOB NO. 3290-05

MOUNTAIN LAKE DAM

FLOW THROUGH OPENING ABOVE THE STOPLOGS

C = .8 A = 8.6 SQ.FT.

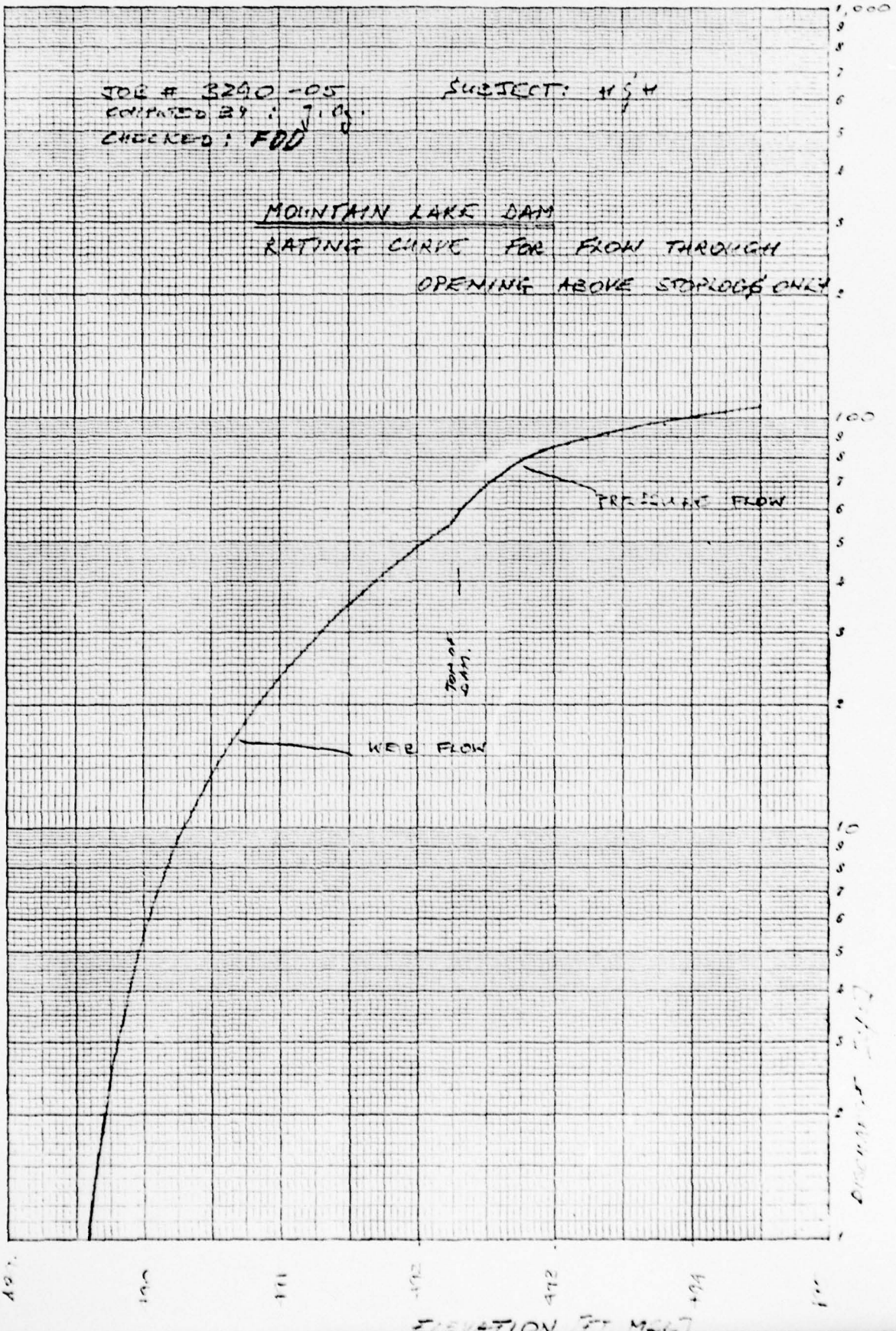
ELEV.	H.	Q.	Q ABOVE DAM	TOTAL [Q's]
492.6	1.9	76.	46.	122.
492.8	2.1	80.		
493.0	2.3	82.7	328.	~ 412
493.2	2.5	87.3		
493.4	2.7	90.7	727.	~ 818.
493.6	2.9	94.0		
493.8	3.1	97.2		
494.0	3.3	100.3	1552.	~ 1652.
494.5	3.8	107.6	2513.	~ 2620.

FLOW OVER THE DAM ONLY

C = 3.5

ELEV.	H.	L	Q [Q's]
492.6	.3	30.	46.
493.0	.7	160.	328.
493.4	1.1	150.	727.
494.0	1.7	200.	1552.
494.5	2.2	220.	2513.

E/E


JOB # 3290-05
COMPUTED BY: JJG
CHECKED: FDD
SUBJECT: H&H
MOUNTAIN LAKE DAM
RATING CURVE FOR FLOW THROUGH OPENING ABOVE STOPLOGS ONLY
PRESSURE FLOW
TOP OF DAM
WEIR FLOW
1,000
100
10
ELEVATION FT MSL

9/16

Job # 3290-05

MOUNTAIN LAKE DAM
RATING CURVE
(WILDWOOD LAKE DAM OUTFLOW NOT INCLUDED)

10,000

1,000

100

10

1

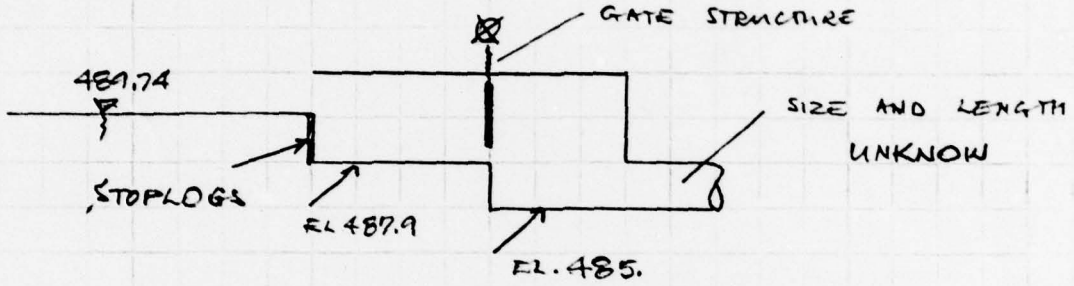
DISCHARGE (cfs)

ELEVATION FT. MSL

491. 490. 491. 492. 493. 494. 495.

COMPUTATIONS FOR WILDWOOD LAKE DAM

SPILLWAY DISCHARGE ONLY.



NOTE:

INFORMATION ABOUT WILDWOOD LAKE DAM WAS RECEIVED (AUG 17 1979) FROM STATE OF N.J. DEPARTMENT OF INVIRONMENTAL PROTECTION DIVISION OF WATRR RESOURES TRENTON, N.J. WHICH WAS BASED ON FIELD INSPECTION DONE BY LARRY LINDGREN.

BECAUSE OF LACK INFORMATION ABOUT SIZE AND LENGTH OF OUTLET PIPE DISCHARGE THROUGH THE SPILLWAY STRUCTURE IS ESTIMATED TO BE NOT HIGHER THAN DISCHARGE OVER THE STOPLOGS.

$C = 3.5$ $L = 3.3$ FEET

ELEV. (FT. MSL)	H (FT)	Q (cfs)
489.8	.1	.4
490.0	.3	1.9
490.2	.5	4.1
490.4	.7	6.8
490.6	.9	9.9
490.8	1.1	11.6
491.0	1.3	17.1
491.5	1.8	27.9

Anderson-Nichols & Company, Inc.

Subject ""

Sheet No. 11 of 14
Date 08-09-79
Computed
Checked

JOB NO. 3290-05

SQUARES 1/4 IN. SCALE

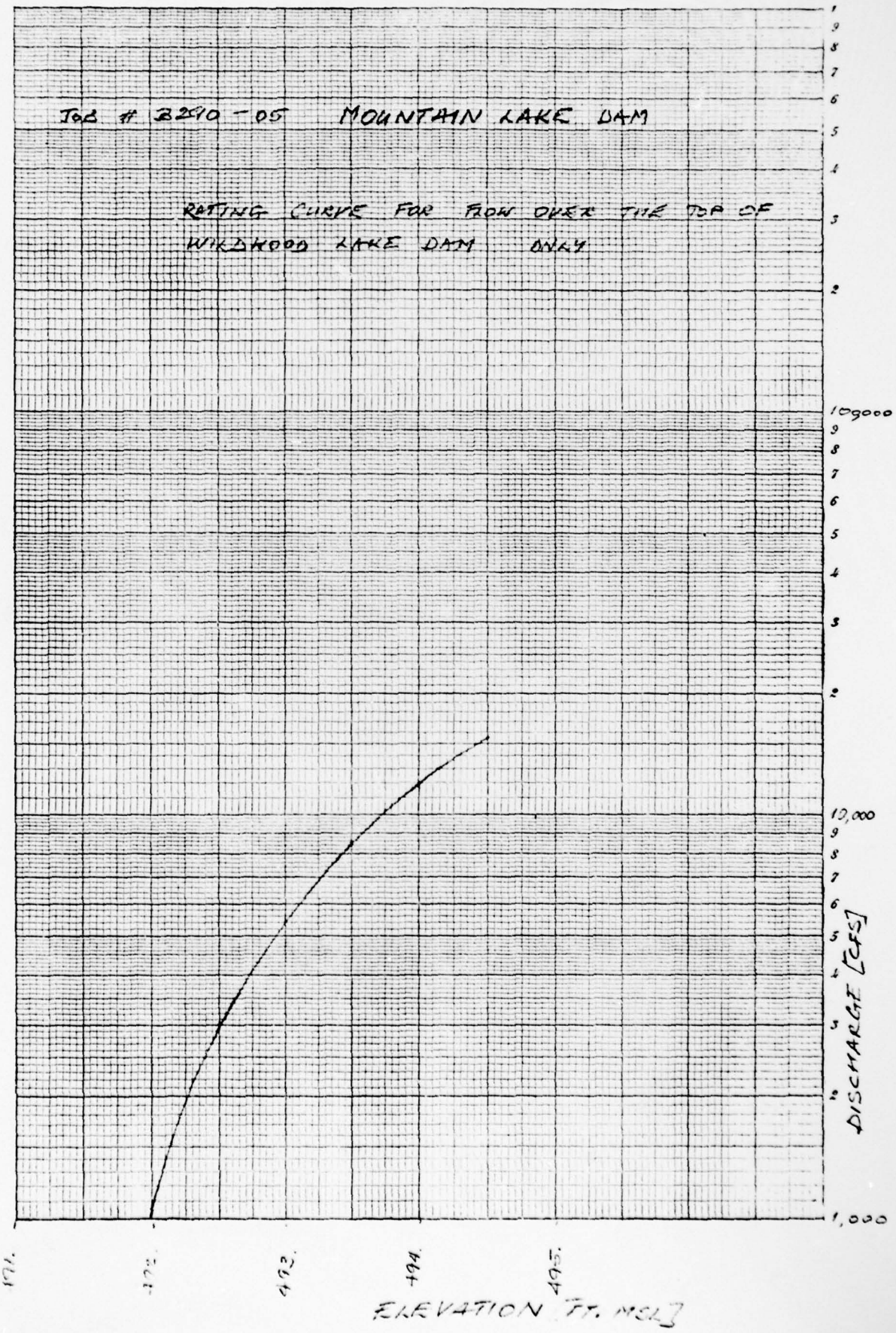
MOUNTAIN LAKE DAM

RATING CURVE CALCULATION FOR FLOW OVER WILDWOOD LAKE DAM ONLY

$C = 3.5$

ELEV. [FT. MSL.]	H [FT]	L [FT]	Q [CFS]
491.5	0	856	0.
492.0	.5	856	1059.
492.5	1.0	857	2999.
493.	1.5	857	5,510.
493.5	2.0	858	8,494.
494.0	2.5	858	11,870.
494.5	3.0	859	15,622.

12/16


JOB # B290-05 MOUNTAIN LAKE DAM
RATING CURVE FOR FLOW OVER THE TOP OF WILDWOOD LAKE DAM ONLY
10,000
12,000
1,000
DISCHARGE [CFS]
491.
492.
493.
494.
495.
ELEVATION FT. MSL

Anderson-Nichols & Company, Inc.

Subject MCM

Sheet No. 13 of 16

Date

Computed

Checked EDD

JOB NO. 2240-05

STORAGE CALCULATION – WILDWOOD LAKE ONLY

(WITH BROOK CONVEYING TO MOUNTAIN LAKE)

ELEV. [FT. MSL]	AVERAGE [IN. FT.]	AVERAGE SURFACE [AC]	STORAGE [AC-FT]
489.4	8.	16.0	128.
489.6	8.2	16.0	131.
489.8	8.4	16.0	134.
490.0	8.6	16.0	138.
490.5	9.1	16.1	146.
491.0	9.6	16.1	155.
491.5	10.1	16.2	164.
492.0	10.6	16.2	172.
492.3	10.9	16.3	178.
492.5	11.4	16.4	187.
493.0	11.9	16.4	195.
493.5	12.4	16.5	205.
494.0	12.9	16.5	213.
494.5	13.4	16.6	222.

Anderson-Nichols & Company, Inc. Subject NSP

Sheet No. 17 of 16
Date 2-74
Computed
Checked EDD

JOB NO. 3290-05 MOUNTAIN LAKE DAM

SQUARES 1/4 IN. SCALE

ELEVATION - DISCHARGE RELATIONSHIP

ELEV. [FT.]		MOUNTAIN LAKE DISCHARGE [cfs]	WILDWOOD LAKE DISCHARGE [cfs]	TOTAL DISCHARGE [cfs]
489.6		1.0	—	1.0
489.8		2.9	.4	3.2
490.0		5.4	1.9	7.3
490.2		8.3	4.1	12.4
490.4		11.6	6.8	18.4
490.6		15.2	9.9	25.1
490.8		19.1	11.6	30.7
491.0		23.4	17.1	40.5
491.5	TOP OF WILDWOOD L.D.	35.1	27.9	63.0
492.0		48.4	1,087.	~1,135.
492.3	TOP OF MOUNTAIN LAKE DAM	59.0	2,175.	~2,230.
492.6		122.0	3,488.	~3,610.
493.0		412.0	5,538.	~5,950.
493.4		818.	7,892.	~8,710.
494.		1652.	11,900.	~13,550.
494.5		2620.	15,650.	~18,270.

derson-Nichols & Company, Inc.

Subject H&H

Sheet No. 15 of 16

Date 04-28-87

Computed [illegible]

Checked EOD

JOB NO. 3290-05

SCALE 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30

STORAGE CALCULATION --

	MOUNTAIN LAKE ONLY			WILDWOOD LAKE	TOTAL
ELEV.	AVERAGE H. [FT]	AVERAGE SURFACE [AC]	STORAGE [AC-FT]	STORAGE [AC-FT]	[AC-FT]
489.4	10.	75.3	753.	128	881.
489.6	10.2	75.3	768.	131	899.
489.8	10.4	75.3	783.	134	917.
490.0	10.6	75.3	798.	138.	936.
490.5	11.1	75.4	837.	146.	982.
491.0	11.6	75.5	876.	155.	1031.
491.5	12.1	75.6	915.	164.	1079.
492.0	12.6	75.7	954.	172.	1126.
492.3	12.9	75.8	976.	178	1154.
492.5	13.4	75.9	1017.	187.	1204.
493.0	13.9	76.0	1056.	195.	1251.
493.5	14.4	76.1	1096.	205.	1301.
494.0	14.9	76.2	1135.	213.	1348.
494.5	15.4	76.3	1175.	222.	1397.

Anderson-Nichols & Company, Inc.

Subject H&H

Sheet No. 16 of 16

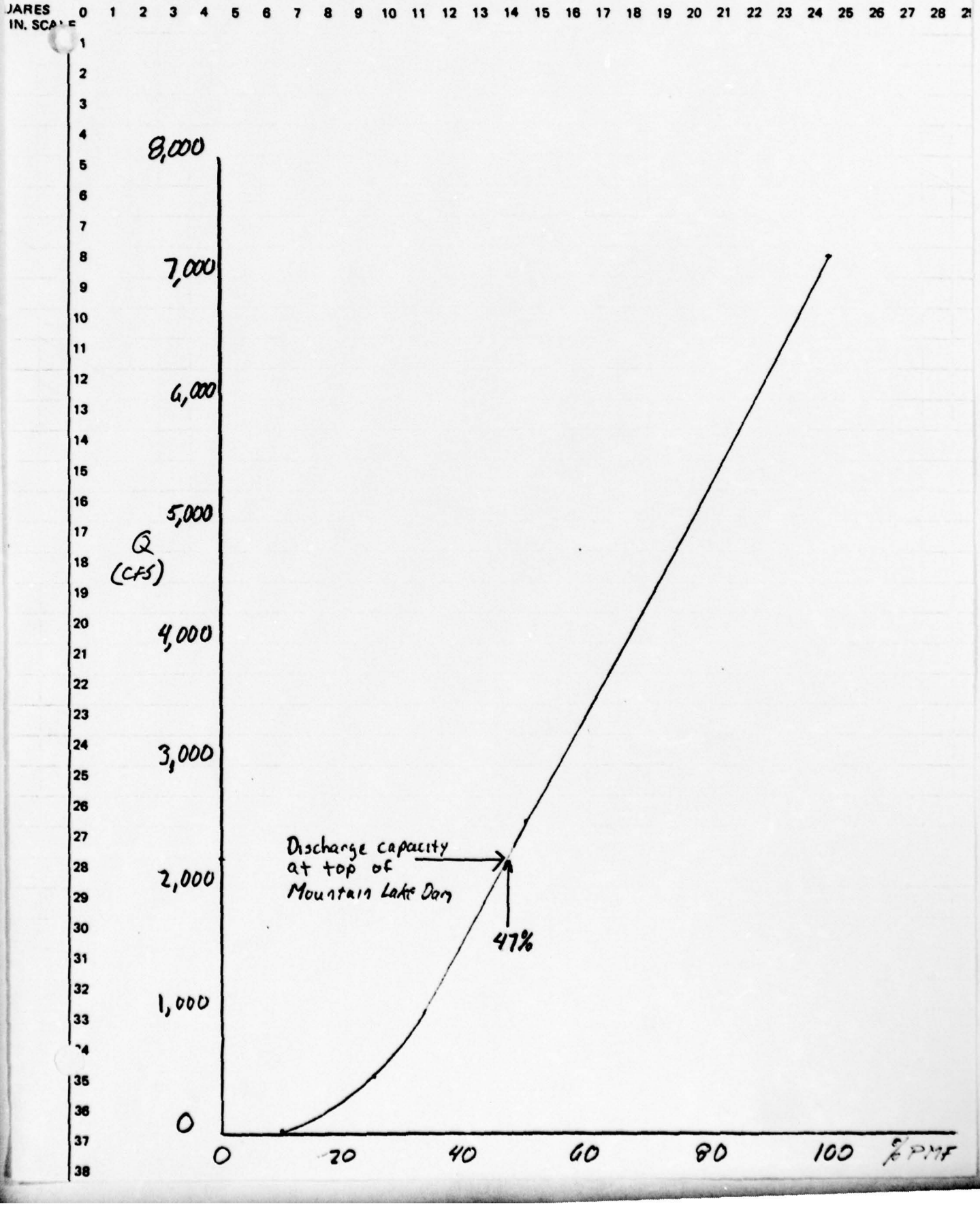
Date 8/79

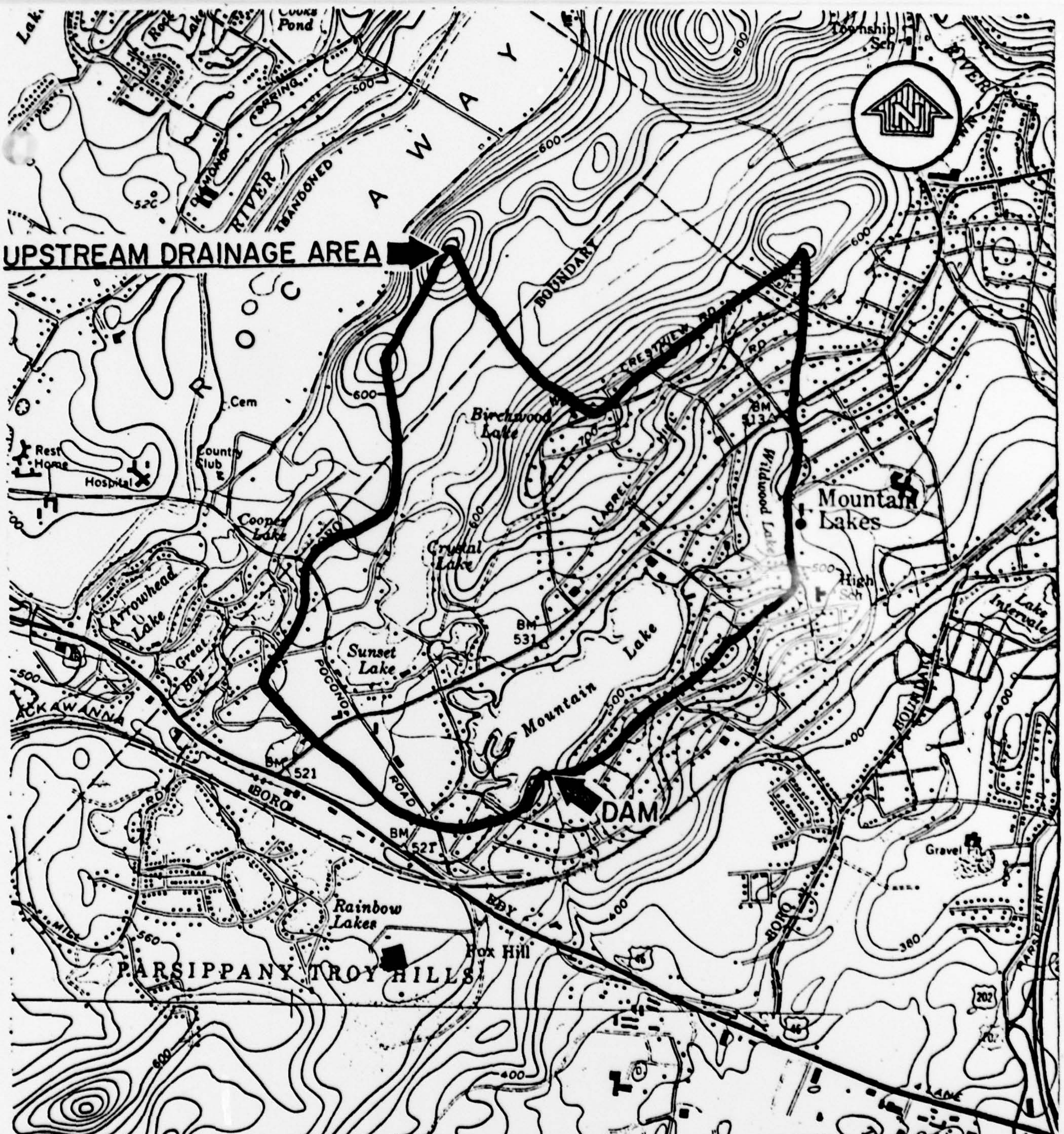
Computed EJD

Checked

JOB NO. 3290-05

MOUNTAIN LAKE DAM





NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

MOUNTAIN LAKE DAM
BOROUGH OF MOUNTAIN LAKES

REGIONAL VICINITY MAP

DEPARTMENT OF THE ARMY
PHILADELPHIA DISTRICT, CORPS OF ENGINEERS
PHILADELPHIA, PENNSYLVANIA

ANDERSON-NICHOLS & CO., INC. BOSTON, MA.

SCALE IN MILES

0 1/2 1

MAP BASED ON U.S.G.S. 7.5 MINUTE QUADRANGLE SHEETS. BOONTON, N.J., 1954, UPDATED 1970. MORRISTOWN, N.J., 1954, UPDATED 1970.

HEC 1 OUTPUT

OVERTOPPING ANALYSIS

MOUNTAIN LAKE DAM

```
A1JOB 3290-05 MOUNTAIN LAKE DAM BOROUGH OF MOUNTAIN LAKES, N.J. U.S. # 284
A2OVERTOPPING ANALYSIS ANDERSON-NICHOLS & CO. INC. CONCORD, N.H.
A30.1.0.25.0.5 AND 1.0 MULTIPLE OF PMF FROM 6 HOUR PMP
B     90                5
B1     5
J      1         4       1
J1    .1       .25      .5      1.
K                A1                                      1
K1OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE
M     -1                .29                     1                       1
N                                                                       1       1
N      1         1       -1       2       2       2       3       3       3       4
N      4         5        5       6       6       7      11      17      23      39
N     55        70       93     116     135     152     165     178     190     206
N    228       268      367     593     866    1030    1047     950     847     735
N    626       533      458     416     383     355     332     313     298     285
N    274       263      252     240     230     220     212     204     197     191
N    185       179      172     160     145     128     111      96      83      72
N     67        62       57      53      50      46      43      40      37      35
K      1        A2        .                                      1
K1ROUTE OUTFLOW TO INLET OF MOUNTAIN LAKE
Y                                       1       1
Y1     1                                                       -1
Y6   .05      .35      .05   487.6     510.   -2800    .0115
Y7    0.      510.     100.     500.    800.     500.     880.   487.6    885.   487.6
Y7  985.      500.    1185.     500.   1555.     510.
K      0        A3                                      1
K1DEVELOP INFLOW HYDROGRAPH FOR MOUNTAIN LAKE DAM
M                2      .98                      .8                      1
O     72
O1   .213     .213     .213     .213     .213     .213     .213     .213     .213     .213
O1   .213     .213     .255     .255     .255     .255     .255     .255     .255     .255
O1   .255     .255     .255     .255     .319     .319     .319     .319     .319     .319
O1   .319     .319     .319     .319     .319     .319     .194     .388     .388     .581
O1   .678    1.647    2.713    1.066     .678     .581     .388     .388     .298     .298
O1   .298     .298     .298     .298     .298     .298     .298     .298     .298     .298
O1   .234     .234     .234     .234     .234     .234     .234     .234     .234     .234
O1   .234     .234
I                                                                       1       .1
W2               .09
X     -3
K      2        A4                                      1
K1DEVELOP COMBINE INFLOW HYDROGRAPH FOR MOUNTAIN LAKE DAM
K      1        A5                                      1
K1OVERTOPPING ANALYSIS
Y                                       1       1
Y1     1                                                -489.60      -1
Y4 489.4    489.6    489.8     490.    490.2    490.4    490.6    490.8     491.    491.5
Y4   492.     492.3    492.6     493.    493.4     494.    494.5
Y5     0.       1.       3.3      7.3     12.4     18.4     25.1     30.7     40.5     63.
Y5  1135.    2240.    3410.    5950.    8710.   13550.   18270.
$S   801      899      917      936      983     1031     1079     1126     1154     1204
$S  1751     1301     1348     1397
$E 489.4    489.6    489.8     490.    490.5     491.    491.5     492.    492.3    492.5
$E   493.     493.5     494.    494.5
$$ 489.4
$D 492.3
K     99
A
```

1 PREVIEW OF SEQUENCE OF STREAM NETWORK CALCULATIONS

```
                    RUNOFF HYDROGRAPH AT          A1
                    ROUTE HYDROGRAPH TO           A2
                    RUNOFF HYDROGRAPH AT          A3
                    COMBINE  2 HYDROGRAPHS AT     A4
                    ROUTE HYDROGRAPH TO           A5
                    END OF NETWORK
```

1**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
****

RUN DATE= 79/08/21.
TIME= 17.21.56.

JOB 3290-05 MOUNTAIN LAKE DAM BOROUGH OF MOUNTAIN LAKES, N.J. U.S. # 284
OVERTOPPING ANALYSIS ANDERSON-NICHOLS & CO. INC. CONCORD, N.H.
0.1,0.25,0.5 AND 1.0 MULTIPLE OF PMF FROM 6 HOUR PMF

JOB SPECIFICATION

NQ	NHR	NMIN	IDAY	IHR	IMIN	METRC	IPLT	IPRT	NSTAN
90	0	5	0	0	0	0	0	0	0
			JOPER	NWT	LROPT	TRACE			
			5	0	0	0			

MULTI-PLAN ANALYSES TO BE PERFORMED
NPLAN= 1 NRTIO= 4 LRTIO= 1

RTIOS= .10 .25 .50 1.00

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

OUTFLOW HYDROGRAPH FROM CRYSTAL LAKE

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A1	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
1	0	.27	0.00	.27	1.00	0.000	0	1	0

INPUT HYDROGRAPH

0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	5.	5.	6.	6.	7.	11.	17.	23.	39.
55.	70.	93.	116.	135.	152.	165.	178.	190.	206.
228.	268.	367.	593.	866.	1030.	1047.	950.	847.	735.
626.	533.	458.	416.	383.	355.	332.	313.	298.	285.
274.	263.	252.	240.	230.	220.	212.	204.	197.	191.
185.	179.	172.	160.	145.	128.	111.	96.	83.	72.
67.	62.	57.	53.	50.	46.	43.	40.	37.	35.

HYDROGRAPH AT STA A1 FOR PLAN 1, RTIO 4

0.	0.	0.	0.	0.	0.	0.	1.	1.	
1.	1.	1.	2.	2.	2.	3.	3.	3.	4.
4.	5.	5.	6.	6.	7.	11.	17.	23.	39.
55.	70.	93.	116.	135.	152.	165.	178.	190.	206.
228.	268.	367.	593.	866.	1030.	1047.	950.	847.	735.
626.	533.	458.	416.	383.	355.	332.	313.	298.	285.
274.	263.	252.	240.	230.	220.	212.	204.	197.	191.
185.	179.	172.	160.	145.	128.	111.	96.	83.	72.
67.	62.	57.	53.	50.	46.	43.	40.	37.	35.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	1047.	229.	184.	184.	16524.
CMS	30.	6.	5.	5.	468.
INCHES		7.35	7.36	7.36	7.36
MM		186.81	186.98	186.98	186.98
AC-FT		114.	114.	114.	114.
THOUS CU M		140.	140.	140.	140.

********** ********** ********** ********** **********

HYDROGRAPH ROUTING

ROUTE OUTFLOW TO INLET OF MOUNTAIN LAKE

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A2	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-1.	0

NORMAL DEPTH CHANNEL ROUTING

QN(1)	QN(2)	QN(3)	ELNVT	ELMAX	RLNTH	SEL
.0500	.3500	.0500	487.6	510.0	2800.	.01150

CROSS SECTION COORDINATES--STA,ELEV,STA,ELEV--ETC

0.00 510.00 100.00 500.00 800.00 500.00 880.00 487.60 885.00 487.60
985.00 500.00 1185.00 500.00 1555.00 510.00

STORAGE	0.00	1.03	3.35	6.97	11.89	18.11	25.62	34.43	44.53	55.94
	68.63	115.85	202.20	292.75	387.49	486.44	589.58	696.92	808.46	924.21
OUTFLOW	0.00	5.85	28.62	76.20	155.40	272.35	432.71	641.79	904.64	1224.06
	1610.68	3245.11	10170.37	21210.16	35881.33	53979.91	75406.60	100114.79	128088.48	159331.13
STAGE	487.60	488.78	489.96	491.14	492.32	493.49	494.67	495.85	497.03	498.21
	499.39	500.57	501.75	502.93	504.11	505.28	506.46	507.64	508.82	510.00
FLOW	0.00	5.85	28.62	76.20	155.40	272.35	432.71	641.79	904.64	1224.06
	1610.68	3245.11	10170.37	21210.16	35881.33	53979.91	75406.60	100114.79	128088.48	159331.13

STATION A2, PLAN 1, RTIO 4

OUTFLOW

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	1.	1.	1.
1.	1.	1.	1.	2.	2.	2.	2.	3.	4.
6.	10.	14.	20.	27.	37.	47.	58.	69.	81.
95.	111.	133.	172.	239.	332.	429.	515.	573.	606.
617.	611.	594.	570.	544.	518.	492.	466.	442.	420.
401.	383.	366.	349.	334.	319.	305.	291.	279.	268.
258.	249.	240.	231.	221.	211.	200.	188.	176.	164.
153.	144.	135.	126.	119.	111.	104.	98.	91.	86.

STOR

0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	0.	0.
0.	0.	0.	0.	0.	0.	0.	0.	1.	1.
1.	1.	2.	2.	3.	4.	5.	6.	6.	7.
8.	9.	10.	13.	16.	21.	25.	29.	32.	33.
33.	33.	32.	31.	30.	29.	28.	27.	26.	25.
24.	23.	22.	22.	21.	20.	20.	19.	18.	18.
17.	17.	16.	16.	15.	15.	14.	14.	13.	12.
12.	11.	11.	10.	10.	9.	9.	8.	8.	8.

STAGE

487.6	487.6	487.6	487.6	487.6	487.6	487.6	487.6	487.6	487.6
487.6	487.6	487.6	487.6	487.7	487.7	487.7	487.7	487.7	487.7
487.8	487.8	487.8	487.9	487.9	487.9	488.0	488.1	488.2	488.4
488.8	489.0	489.2	489.5	489.9	490.2	490.4	490.7	491.0	491.2
491.4	491.7	492.0	492.5	493.2	493.9	494.6	495.1	495.5	495.6
495.7	495.7	495.6	495.4	495.3	495.2	495.0	494.9	494.7	494.6
494.4	494.3	494.2	494.1	493.9	493.8	493.7	493.6	493.5	493.5
493.4	493.3	493.2	493.1	493.0	492.9	492.8	492.6	492.5	492.4
492.3	492.1	492.0	491.9	491.8	491.7	491.6	491.5	491.4	491.3

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	617.	214.	171.	171.	15427.
CMS	17.	6.	5.	5.	437.
INCHES		6.87	6.87	6.87	6.87
MM		174.55	174.57	174.57	174.57
AC FT		106.	106.	106.	106.
THOUS CU M		131.	131.	131.	131.

MAXIMUM STORAGE = 33.

MAXIMUM STAGE IS 495.7

********** ********** ********** ********** **********

SUB-AREA RUNOFF COMPUTATION

DEVELOP INFLOW HYDROGRAPH FOR MOUNTAIN LAKE DAM

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A3	0	0	0	0	0	1	0	0

HYDROGRAPH DATA

IHYDG	IUHG	TAREA	SNAP	TRSDA	TRSPC	RATIO	ISNOW	ISAME	LOCAL
0	2	.98	0.00	.98	.80	0.000	0	1	0

PRECIP DATA

NP	STORM	DAJ	DAK
72	0.00	0.00	0.00

PRECIP PATTERN

.21	.21	.21	.21	.21	.21	.21	.21	.21	.21
.21	.21	.26	.26	.26	.26	.26	.26	.26	.26
.26	.26	.26	.26	.32	.32	.32	.32	.32	.32
.32	.32	.32	.32	.32	.32	.19	.39	.39	.58
.68	1.65	2.71	1.07	.68	.58	.39	.39	.30	.30
.30	.30	.30	.30	.30	.30	.30	.30	.30	.30
.23	.23	.23	.23	.23	.23	.23	.23	.23	.23
.23	.23								

LOSS DATA

LROPT	STRKR	DLTKR	RTIOL	ERAIN	STRKS	RTIOK	STRTL	CNSTL	ALSMX	RTIMP
0	0.00	0.00	1.00	0.00	0.00	1.00	1.00	.10	0.00	0.00

UNIT HYDROGRAPH DATA

TC= 0.00 LAG= .09

RECESSION DATA

STRTQ= -3.00 QRCSN= 0.00 RTIOR= 1.00

TIME INCREMENT TOO LARGE--(NHD IS GT LAG/2)

UNIT HYDROGRAPH 7 END OF PERIOD ORDINATES, TC= 0.00 HOURS, LAG= .09 VOL= 1.00

2560. 3175. 1188. 433. 153. 54. 21.

MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	END-OF-PERIOD FLOW COMP Q	MO.DA	HR.MN	PERIOD	RAIN	EXCS	LOSS	COMP Q
1.01	.05	1	.17	0.00	.17	3.	1.01	3.50	46	.46	.46	.01	5047.
1.01	.10	2	.17	0.00	.17	3.	1.01	3.55	47	.31	.30	.01	3640.
1.01	.15	3	.17	0.00	.17	3.	1.01	4.00	48	.31	.30	.01	2783.
1.01	.20	4	.17	0.00	.17	3.	1.01	4.05	49	.24	.23	.01	2281.
1.01	.25	5	.17	0.00	.17	3.	1.01	4.10	50	.24	.23	.01	1929.
1.01	.30	6	.17	.02	.15	57.	1.01	4.15	51	.24	.23	.01	1809.
1.01	.35	7	.17	.16	.01	485.	1.01	4.20	52	.24	.23	.01	1768.
1.01	.40	8	.17	.16	.01	958.	1.01	4.25	53	.24	.23	.01	1753.
1.01	.45	9	.17	.16	.01	1134.	1.01	4.30	54	.24	.23	.01	1750.
1.01	.50	10	.17	.16	.01	1199.	1.01	4.35	55	.24	.23	.01	1748.
1.01	.55	11	.17	.16	.01	1221.	1.01	4.40	56	.24	.23	.01	1748.
1.01	1.00	12	.17	.16	.01	1229.	1.01	4.45	57	.24	.23	.01	1748.
1.01	1.05	13	.20	.20	.01	1318.	1.01	4.50	58	.24	.23	.01	1748.
1.01	1.10	14	.20	.20	.01	1425.	1.01	4.55	59	.24	.23	.01	1748.
1.01	1.15	15	.20	.20	.01	1465.	1.01	5.00	60	.24	.23	.01	1748.
1.01	1.20	16	.20	.20	.01	1479.	1.01	5.05	61	.19	.18	.01	1617.
1.01	1.25	17	.20	.20	.01	1485.	1.01	5.10	62	.19	.18	.01	1454.
1.01	1.30	18	.20	.20	.01	1486.	1.01	5.15	63	.19	.18	.01	1394.
1.01	1.35	19	.20	.20	.01	1487.	1.01	5.20	64	.19	.18	.01	1371.
1.01	1.40	20	.20	.20	.01	1487.	1.01	5.25	65	.19	.18	.01	1364.
1.01	1.45	21	.20	.20	.01	1487.	1.01	5.30	66	.19	.18	.01	1361.
1.01	1.50	22	.20	.20	.01	1487.	1.01	5.35	67	.19	.18	.01	1360.
1.01	1.55	23	.20	.20	.01	1487.	1.01	5.40	68	.19	.18	.01	1360.
1.01	2.00	24	.20	.20	.01	1487.	1.01	5.45	69	.19	.18	.01	1360.
1.01	2.05	25	.26	.25	.01	1618.	1.01	5.50	70	.19	.18	.01	1360.
1.01	2.10	26	.26	.25	.01	1781.	1.01	5.55	71	.19	.18	.01	1360.
1.01	2.15	27	.26	.25	.01	1842.	1.01	6.00	72	.19	.18	.01	1360.
1.01	2.20	28	.26	.25	.01	1864.	1.01	6.05	73	0.00	0.00	0.00	902.
1.01	2.25	29	.26	.25	.01	1872.	1.01	6.10	74	0.00	0.00	0.00	334.
1.01	2.30	30	.26	.25	.01	1874.	1.01	6.15	75	0.00	0.00	0.00	121.
1.01	2.35	31	.26	.25	.01	1875.	1.01	6.20	76	0.00	0.00	0.00	44.
1.01	2.40	32	.26	.25	.01	1875.	1.01	6.25	77	0.00	0.00	0.00	16.
1.01	2.45	33	.26	.25	.01	1875.	1.01	6.30	78	0.00	0.00	0.00	7.
1.01	2.50	34	.26	.25	.01	1875.	1.01	6.35	79	0.00	0.00	0.00	3.
1.01	2.55	35	.26	.25	.01	1875.	1.01	6.40	80	0.00	0.00	0.00	3.
1.01	3.00	36	.26	.25	.01	1875.	1.01	6.45	81	0.00	0.00	0.00	3.
1.01	3.05	37	.16	.15	.01	1619.	1.01	6.50	82	0.00	0.00	0.00	3.
1.01	3.10	38	.31	.30	.01	1699.	1.01	6.55	83	0.00	0.00	0.00	3.
1.01	3.15	39	.31	.30	.01	2071.	1.01	7.00	84	0.00	0.00	0.00	3.
1.01	3.20	40	.46	.46	.01	2610.	1.01	7.05	85	0.00	0.00	0.00	3.
1.01	3.25	41	.54	.53	.01	3350.	1.01	7.10	86	0.00	0.00	0.00	3.
1.01	3.30	42	1.32	1.31	.01	5783.	1.01	7.15	87	0.00	0.00	0.00	3.
1.01	3.35	43	2.17	2.16	.01	10593.	1.01	7.20	88	0.00	0.00	0.00	3.
1.01	3.40	44	.85	.84	.01	10910.	1.01	7.25	89	0.00	0.00	0.00	3.
1.01	3.45	45	.54	.53	.01	7601.	1.01	7.30	90	0.00	0.00	0.00	3.
									SUM	20.41	18.86	1.55	143346.
										(519.)(479.)(39.)(4059.11)			

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10910.	1990.	1593.	1593.	143344.
CMS	309.	56.	45.	45.	4059.
INCHES		18.89	18.90	18.90	18.90
MM		479.80	480.00	480.00	480.00
AC-FT		987.	987.	987.	987.
THOUS CU M		1217.	1218.	1218.	1218.

HYDROGRAPH AT STA A3 FOR PLAN 1, RTIO 4

3.	3.	3.	3.	3.	57.	485.	958.	1134.	1199.
1221.	1229.	1318.	1425.	1465.	1479.	1485.	1486.	1487.	1487.
1487.	1487.	1487.	1487.	1618.	1781.	1842.	1864.	1872.	1874.
1875.	1875.	1875.	1875.	1875.	1875.	1619.	1699.	2073.	2610.
3350.	5783.	10593.	10910.	7301.	5047.	3640.	2783.	2281.	1929.
1909.	1768.	1753.	1750.	1748.	1748.	1748.	1748.	1748.	1748.
1617.	1454.	1394.	1371.	1364.	1361.	1360.	1360.	1360.	1360.
1360.	1360.	902.	334.	121.	44.	16.	7.	3.	3.
3.	3.	3.	3.	3.	3.	3.	3.	3.	3.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	10910.	1990.	1593.	1593.	143344.
CMS	309.	56.	45.	45.	4059.
INCHES		18.89	18.90	18.90	18.90
MM		479.80	480.00	480.00	480.00
AC-FT		987.	987.	987.	987.
THOUS CU M		1217.	1218.	1218.	1218.

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COMBINE HYDROGRAPHS

DEVELOP-COMBINE INFLOW HYDROGRAPH FOR MOUNTAIN LAKE DAM

ISTAO	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
A4	2	0	0	0	0	1	0	0

SUM OF 2 HYDROGRAPHS AT A4 PLAN 1 RTIO 4

3.	3.	3.	3.	3.	57.	485.	958.	1134.	1199.
1221.	1229.	1318.	1425.	1465.	1480.	1485.	1487.	1488.	1488.
1488.	1488.	1488.	1488.	1620.	1782.	1844.	1866.	1875.	1879.
1881.	1885.	1890.	1896.	1902.	1912.	1667.	1757.	2142.	2690.
3446.	5894.	10726.	11081.	7540.	5379.	4069.	3298.	2853.	2535.
2426.	2379.	2347.	2320.	2292.	2266.	2240.	2214.	2190.	2168.
2018.	1837.	1759.	1721.	1697.	1680.	1664.	1651.	1639.	1628.
1618.	1609.	1142.	565.	343.	255.	216.	195.	179.	167.
156.	147.	138.	129.	122.	114.	107.	101.	94.	89.

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	11081.	2182.	1764.	1764.	158770.
CMS	314.	62.	50.	50.	4496.
INCHES		15.99	16.15	16.15	16.15
MM		406.03	410.26	410.26	410.26
AC-FT		1082.	1093.	1093.	1093.
THOUS CU M		1335.	1349.	1349.	1349.

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HYDROGRAPH ROUTING

OVERTOPPING ANALYSIS

ISTAQ	ICOMP	IECON	ITAPE	JPLT	JPRT	INAME	ISTAGE	IAUTO
AS	1	0	0	0	0	1	0	0

ROUTING DATA

QLOSS	CLOSS	AVG	IRES	ISAME	IOPT	IPMP	LSTR
0.0	0.000	0.00	1	1	0	0	0

NSTPS	NSTDL	LAG	AMSKK	X	TSK	STORA	ISPRAT
1	0	0	0.000	0.000	0.000	-490.	-1

STAGE	489.40	489.60	489.80	490.00	490.20	490.40	490.60	490.80	491.00	491.50
	492.00	492.30	492.60	493.00	493.40	494.00	494.50			
FLOW	0.00	1.00	3.30	7.30	12.40	18.40	25.10	30.70	40.50	63.00
	1135.00	2230.00	3610.00	5950.00	8710.00	13550.00	18270.00			
CAPACITY=	881.	899.	917.	936.	983.	1031.	1079.	1126.	1154.	1204.
0										
CAPACITY=	881.	899.	917.	936.	983.	1031.	1079.	1126.	1154.	1204.
	1251.	1301.	1348.	1397.						
ELEVATION=	489.	490.	490.	490.	491.	491.	492.	492.	492.	493.
	493.	494.	494.	495.						

CREL	SPWID	COQW	EXPW	ELEVL	COQL	CAREA	EXPL
489.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0

DAM DATA

0

DAM DATA

TOPEL	COQD	EXPD	DAMWID
492.3	0.0	0.0	0.

STATION AS, PLAN 1, RATIO 4

END-OF-PERIOD HYDROGRAPH ORDINATES

OUTFLOW

1.	1.	1.	1.	1.	1.	1.	2.	3.	4.
6.	8.	10.	13.	16.	19.	23.	26.	29.	33.
38.	43.	48.	52.	57.	62.	287.	515.	712.	882.
1027.	1163.	1335.	1467.	1570.	1644.	1676.	1684.	1743.	1903.
2179.	2501.	3255.	5876.	7188.	6908.	6070.	5218.	4462.	3838.
3405.	3132.	3040.	2956.	2878.	2807.	2741.	2680.	2623.	2570.
2513.	2443.	2366.	2292.	2215.	2090.	1990.	1917.	1857.	1808.
1767.	1733.	1654.	1464.	1224.	1055.	936.	829.	736.	654.
582.	519.	464.	420.	380.	344.	312.	284.	259.	236.

STORAGE

899.	899.	899.	899.	899.	899.	901.	906.	913.	921.
930.	938.	947.	956.	966.	976.	986.	996.	1006.	1016.
1026.	1036.	1046.	1056.	1066.	1078.	1089.	1099.	1107.	1115.
1121.	1127.	1131.	1135.	1137.	1139.	1140.	1140.	1142.	1146.
1153.	1169.	1206.	1250.	1269.	1265.	1253.	1239.	1227.	1217.
1209.	1203.	1198.	1193.	1189.	1185.	1182.	1178.	1175.	1172.
1169.	1166.	1161.	1157.	1154.	1150.	1148.	1146.	1144.	1143.
1142.	1141.	1139.	1134.	1128.	1122.	1117.	1113.	1108.	1105.
1102.	1099.	1097.	1095.	1093.	1091.	1090.	1089.	1088.	1087.

STAGE

489.6	489.6	489.6	489.6	489.6	489.6	489.6	489.7	489.8	489.8
489.9	490.0	490.1	490.2	490.3	490.4	490.5	490.6	490.7	490.8
490.9	491.1	491.2	491.3	491.4	491.5	491.6	491.7	491.8	491.9
491.9	492.0	492.1	492.1	492.1	492.1	492.1	492.2	492.2	492.2
492.3	492.4	492.5	493.0	493.2	493.1	493.0	492.9	492.7	492.6
492.6	492.5	492.5	492.5	492.4	492.4	492.4	492.4	492.4	492.4
492.4	492.3	492.3	492.3	492.3	492.3	492.2	492.2	492.2	492.2
492.2	492.2	492.1	492.1	492.0	492.0	491.9	491.9	491.8	491.8
491.7	491.7	491.7	491.7	491.6	491.6	491.6	491.6	491.6	491.6

PEAK OUTFLOW IS 7188. AT TIME 3.75 HOURS

	PEAK	6-HOUR	24-HOUR	72-HOUR	TOTAL VOLUME
CFS	7188.	1827.	1463.	1463.	131657.
CMS	204.	52.	41.	41.	3728.
INCHES		13.38	13.39	13.39	13.39
MM		339.88	340.20	340.20	340.20
AC-FT		906.	907.	907.	907.
THOUS CU M		1117.	1118.	1118.	1118.

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PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS RATIO 1 .10	RATIO 2 .25	RATIO 3 .50	RATIO 4 1.00
HYDROGRAPH AT	A1	.29	1	105.	262.	524.	1047.
	(	.75)	(	2.96)(	7.41)(	14.82)(	29.65)(
ROUTED TO	A2	.29	1	44.	127.	280.	617.
	(	.75)	(	1.24)(	3.59)(	7.93)(	17.47)(
HYDROGRAPH AT	A3	.98	1	1091.	2727.	5455.	10910.
	(	2.54)	(	30.89)(	77.23)(	154.46)(	308.92)(
2 COMBINED	A4	1.27	1	1101.	2759.	5528.	11081.
	(	3.29)	(	31.19)(	78.12)(	156.54)(	313.78)(
ROUTED TO	A5	1.27	1	27.	466.	2535.	7188.
	(	3.29)	(	.77)(	13.21)(	71.79)(	203.54)(

PLAN 1 STATION A2

RATIO	MAXIMUM FLOW,CFS	MAXIMUM STAGE,FT	TIME HOURS
.10	44.	490.3	4.42
.25	127.	491.9	4.33
.50	280.	493.6	4.33
1.00	617.	495.7	4.25

1 SUMMARY OF DAM SAFETY ANALYSIS

PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	489.60	489.40	492.30
STORAGE	899.	881.	1154.
OUTFLOW	1.	0.	2230.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.10	490.47	0.00	1000.	27.	0.00	6.42	0.00
.25	491.69	0.00	1097.	466.	0.00	5.17	0.00
.50	492.37	.07	1171.	2535.	.42	3.83	0.00
1.00	493.18	.88	1269.	7188.	1.92	3.75	0.00

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FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION JULY 1978
LAST MODIFICATION 26 FEB 79
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APPENDIX 4

REFERENCES

MOUNTAIN LAKE DAM

APPENDIX 4

REFERENCES

MOUNTAIN LAKE DAM

1. U.S. Army Corps of Engineers, Hydrologic Engineering Center, "Flood Hydrograph Package (HEC-1) for Dam Safety Inspections - User's Manual," Davis, California, September 1978.

2. Brater, Ernest F. and King, Horace, Handbook of Hydraulics, Sixth Edition, McGraw-Hill, New York, 1976.

3. U.S. Bureau of Public Roads, "Design Charts for Open Channel Flow," October 1960.

4. Department of the Army, Philadelphia District, Corps of Engineers, Pennsylvania 19106. Crystal Lake Dam - Phase I Inspection Report, National Dam Safety Program, August 1979.